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Environmental Protection

Environmental Principles, Assessments and Protection Measures

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Environmental Protection: Environmental Principles, Assessments and Protection Measures
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December 2016	Version 1.0
April 2017	Version 1.1 – Administrative updates to sections 2.1 (to match the French document) and 3.2.4, and to the definition of "environmental effects" in the glossary
September 2020	Version 1.2 – Administrative updates throughout to reflect the *Impact Assessment Act*

Preface

This regulatory document is part of the CNSC's environmental protection series of regulatory documents. The full list of regulatory document series is included at the end of this document and can also be found on the CNSC's website.

REGDOC-2.9.1, *Environmental Principles, Assessments and Protection Measures*, describes:

- the CNSC's principles for environmental protection
- for all nuclear facilities or activities that interact with the environment, the scope of an environmental review and the roles and responsibilities associated with an environmental review
- the CNSC's requirements and guidance to applicants and licensees for developing environmental protection measures, including an environmental risk assessment (ERA) where required, for both new and existing facilities or activities

This document is Version 1.2. It supersedes Version 1.1, which was published in April 2017.

Environmental protection for nuclear facilities and activities is done in accordance with the *Nuclear Safety and Control Act* (NSCA) and the regulations made under it. The CNSC requires the environmental effects of all nuclear facilities or activities to be considered and evaluated when licensing decisions are made.

This document will be used to assess licence applications for proposed new nuclear facilities or activities, licence applications for existing facilities or activities (renewals and amendments), and environmental protection measures, as follows:

- all licence applications that demonstrate potential interactions between the facility or activity and the environment are subject to an environmental review
- for each facility or activity that has direct interactions with the environment, the applicant or licensee must demonstrate that environmental protection measures are or will be in place
- where an environmental risk assessment (ERA) is required for a facility or activity (details are included in this regulatory document):
  - the ERA is subject to regular updates (at least every five years, and whenever a significant change occurs in either the facility or activity that could alter the nature (type or magnitude) of the interaction with the environment within the ERA predictions)
  - the licensee's ERA informs an environmental review

In all cases, the environmental review, the environmental protection measures and the ERA (where required) are commensurate with the scale and complexity of the environmental risks associated with the nuclear facility or activity.

Note: For facilities or activities other than Class I nuclear facilities and uranium mines and mills, the CNSC reviews every licence application to verify that there are no significant interactions with the environment (for example, for most Class II facilities, such as hospitals and universities, and for the use and transport of nuclear substances and radiation devices, there is no interaction with the environment). If the CNSC's review of the application determines that the facility or activity:

(a) has potential interactions with the environment and that additional consideration of environmental protection measures is warranted, the information in this document may be applied in a graded manner

(b) does not interact with the environment, then only the CNSC's guiding principles for environmental protection (in section 2.1 of this document) are relevant as guidance for such facilities or activities

Early engagement with CNSC staff is encouraged for facilities or activities with potential interactions with the environment or for applicants uncertain as to their facility's or activity's potential for interaction with the environment. CNSC staff can provide facility- or activity-specific guidance to assist applicants and licensees.

A document that shows the changes made to REGDOC-2.9.1, Version 1.1 is available from the CNSC upon request.

For information on the implementation of regulatory documents and on the graded approach, see REGDOC-3.5.3, *Regulatory Fundamentals*.

The words "shall" and "must" are used to express requirements to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is advised or permissible within the limits of this regulatory document. "Can" is used to express possibility or capability.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

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Environmental Principles, Assessments and Protection Measures

1. Introduction

1.1 Purpose

Environmental protection for nuclear facilities and activities is done in accordance with the *Nuclear Safety and Control Act* (NSCA) and the regulations made under the NSCA. This legislation includes provisions to ensure that licensees are adequately protecting the environment and the health, safety and security of persons. The CNSC requires the environmental effects of all nuclear facilities or activities to be considered and evaluated when licensing decisions are made.

This regulatory document provides information to applicants and licensees on protecting the environment and the health of persons, including:

- identification of facility or activity interactions with the environment and the public
- identification and mitigation of potential environmental effects associated with these interactions
- design and implementation of effluent and emission release measures and of the environmental monitoring measures to confirm or test the predictions and the actual effects
- periodic assessments of the environmental protection measures and the licensee's performance

In particular, this regulatory document describes:

- the CNSC's principles for environmental protection
- for all nuclear facilities or activities that interact with the environment, the scope and type of environmental review, commensurate with the scale and complexity of the environmental risks
- the CNSC's requirements and guidance to applicants and licensees for developing environmental protection measures, including an environmental risk assessment (ERA) where required, for both new and existing facilities or activities

1.2 Scope

This regulatory document clarifies the CNSC's expectations of applicants and licensees, and provides guidance for protecting the environment and the health of persons.

This document will be used to assess licence applications for proposed new nuclear facilities or activities, licence applications for existing facilities or activities (renewals and amendments), and environmental protection measures:

- all licence applications that demonstrate potential interactions between the facility or activity and the environment are subject to an environmental review
- for each facility or activity that has direct interactions with the environment, the applicant or licensee must demonstrate that environmental protection measures are or will be in place

- where an ERA is required for a facility or activity (details are included in this regulatory document):
  - the ERA is subject to regular updates (at least every five years, and whenever a significant change occurs in either the facility or activity that could alter the nature (type or magnitude) of the interaction with the environment
  - the licensee's ERA informs an environmental review

In all cases, the environmental review, the environmental protection measures and the ERA (where required) are commensurate with the scale and complexity of the environmental risks associated with the nuclear facility or activity.

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, the CNSC reviews every licence application to verify that there are no significant interactions with the environment (for example, for most Class II facilities, such as hospitals and universities, and for the use and transport of nuclear substances and radiation devices, there is no interaction with the environment). If the CNSC's review of the application determines that the facility or activity:

- has potential interactions with the environment and that additional consideration of environmental protection measures is warranted, the information in this document may be applied in a graded manner
- does not interact with the environment, then only the CNSC's guiding principles for environmental protection (in section 2.1 of this document) are relevant as guidance for such facilities or activities

Early engagement with CNSC staff is encouraged for facilities or activities with potential interactions with the environment or for applicants uncertain as to their facility's or activity's potential for interaction with the environment. CNSC staff can provide facility- or activity-specific guidance to assist applicants and licensees.

Note: The intent of these requirements is not to replace or duplicate other federal, provincial or territorial, and municipal legislation with which licensees must comply. Where applicable, meeting the existing legislative requirements is adequate for meeting the requirements of this regulatory document.

1.3 Relevant legislation

The following provisions of the NSCA and the regulations made under it are relevant to this document:

- NSCA:
  - subsection 24(4)
  - subsection 24(5)
- *General Nuclear Safety and Control Regulations*:
  - paragraph 3(1)(f)
  - paragraphs 12(1)(c) and (f)

- *Class I Nuclear Facilities Regulations*:
    - paragraphs 3(e), (g), (h) and (j);
    - paragraphs 4(c) and (e);
    - paragraphs 5(b), (i), (j) and (k)
    - paragraphs 6(h), (i), (j) and (k)
    - paragraphs 7(e), (f), (g), (h), (i) and (k)
    - paragraph 8(b)
- *Class II Nuclear Facilities and Prescribed Equipment Regulations*:
    - paragraph 3(p)
    - paragraphs 5(e), (f), (h) and (i)
- *Radiation Protection Regulations*:
    - paragraphs 4(a) and (b)
    - subsections 6(1) and (2)
    - subsection 13(1)
- *Nuclear Substances and Radiation Devices Regulations*:
    - paragraphs 3(1)(b)
    - paragraph 31(1)(i)
- *Uranium Mines and Mills Regulations*:
    - subparagraph 3(a)(v)
    - subparagraphs 3(c)(ii), (iii), (v), (vi), (vii), (viii), (ix) and (x)
    - subparagraphs 3(d)(i) and (vi)

The *Impact Assessment Act* (IAA) applies in the following instances:
- designated projects as defined in section 2 of the IAA
- projects proposed to be carried out on federal lands, as defined in section 82 of the IAA

Under section 182 of the IAA, any environmental assessment of a designated project by the CNSC commenced under the Canadian Environmental Assessment Act, 2012 (CEAA 2012), in respect of which a decision has not yet been issued before the coming into force of the IAA, is continued under CEAA 2012 as if that Act had not been repealed.

The CNSC also considers pertinent legislation from other government departments, including:
- *Canadian Environmental Protection Act, 1999*
- *Fisheries Act*
- *Species at Risk Act*
- *Migratory Birds Convention Act, 1994*

1.4 National and international standards

The following standards from the CSA Group are relevant to this regulatory document:
- CAN/CSA ISO-14001, *Environmental Management Systems – Requirements with Guidance for Use* (2004 edition or successor editions) [1, 2]
- CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* [3]
- CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* [4]
- CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* [5]

- CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6]
- CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* [7]

The CNSC licensing process ensures that applicable regulatory documents are considered for licensing applications. The information required to comply with those regulatory documents may contribute to meeting the requirements in this document. All regulatory documents are available on the CNSC website.

1.5 CNSC contact information

The applicant or licensee should engage with CNSC staff early in the planning process (before submission of a licence application) to identify the applicable regulatory documents and confirm an understanding of the licensing process.

To contact the CNSC:

- Tel.: 613-995-5894 or 1-800-668-5284 (in Canada only)
- Fax: 613-995-5086
- Email: cnsc.info.ccsn@canada.ca

2. The CNSC's Environmental Protection Principles

Protecting the environment is part of the CNSC's mandate. The CNSC requires the environmental effects of all facilities or activities to be evaluated and considered when licensing decisions are made (see figure 1). For each licensing decision, the CNSC (the Commission or a Designated Officer) must be satisfied that the applicant or licensee will make adequate provision for the protection of the environment and the health and safety of persons before a licence can be granted.

2.1 The CNSC's guiding principles for protection of the environment

The CNSC regulates nuclear facilities and activities in Canada to protect the environment and the health and safety of persons in a manner that is consistent with Canadian environmental policies, acts and regulations and with Canada's international obligations.

For each facility or activity that has direct interactions with the environment, the CNSC must determine that the licensee or applicant has made adequate provision for the protection of the environment. The applicant or licensee's licence application shall demonstrate (through performance assessments, monitoring or other assessments) that their environmental protection measures:

- are commensurate with the level of risk associated with the activity
- recognize that uncertainty exists in science and account for this uncertainty:
    - by keeping all releases to the environment as low as reasonably achievable (ALARA), social and economic factors being taken into account for nuclear substances [8]
    - through the application of the best available technology and techniques economically achievable (BATEA) for hazardous substances
- respect the precautionary principle, the "polluter pays" principle, and the concepts of pollution prevention, sustainable development and adaptive management
- are assessed against performance indicators and targets that are based on sound science

The following sections of this regulatory document provide information on how to meet these principles. The CNSC assesses proposed alternative approaches and takes into account the views and proposals of the licensee concerning their individual situations.

2.2 The CNSC's environmental protection framework

The CNSC's environmental protection safety and control area (SCA) covers measures that identify, control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities.

The applicant's or licensee's environmental protection measures should address all aspects of the CNSC's environmental protection SCA that are relevant to the facility or activity. The scope and complexity within each measure should be commensurate with the nature and scale of the interactions with the environment that may result from the facility or activity.

Note: The CNSC uses the term "environmental protection measures". The elements in these measures may be referenced by applicants and licensees in their "environmental protection programs". Applicants and licensees are not required to update their management system or other documents to reflect the term "environmental protection measures", but they must meet the requirements listed in this document.

Figure 1: Ensuring adequate provision for protection of the environment

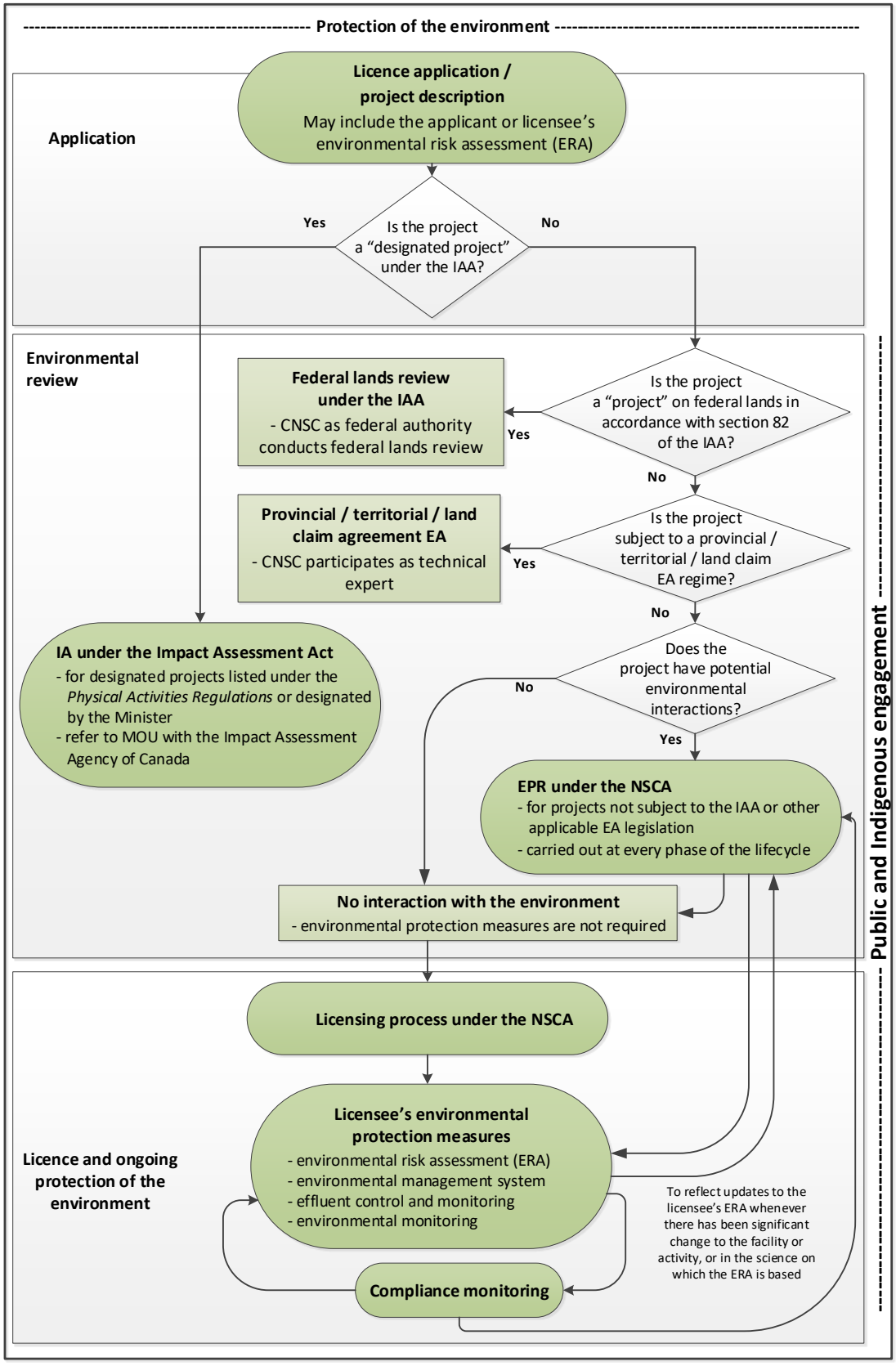
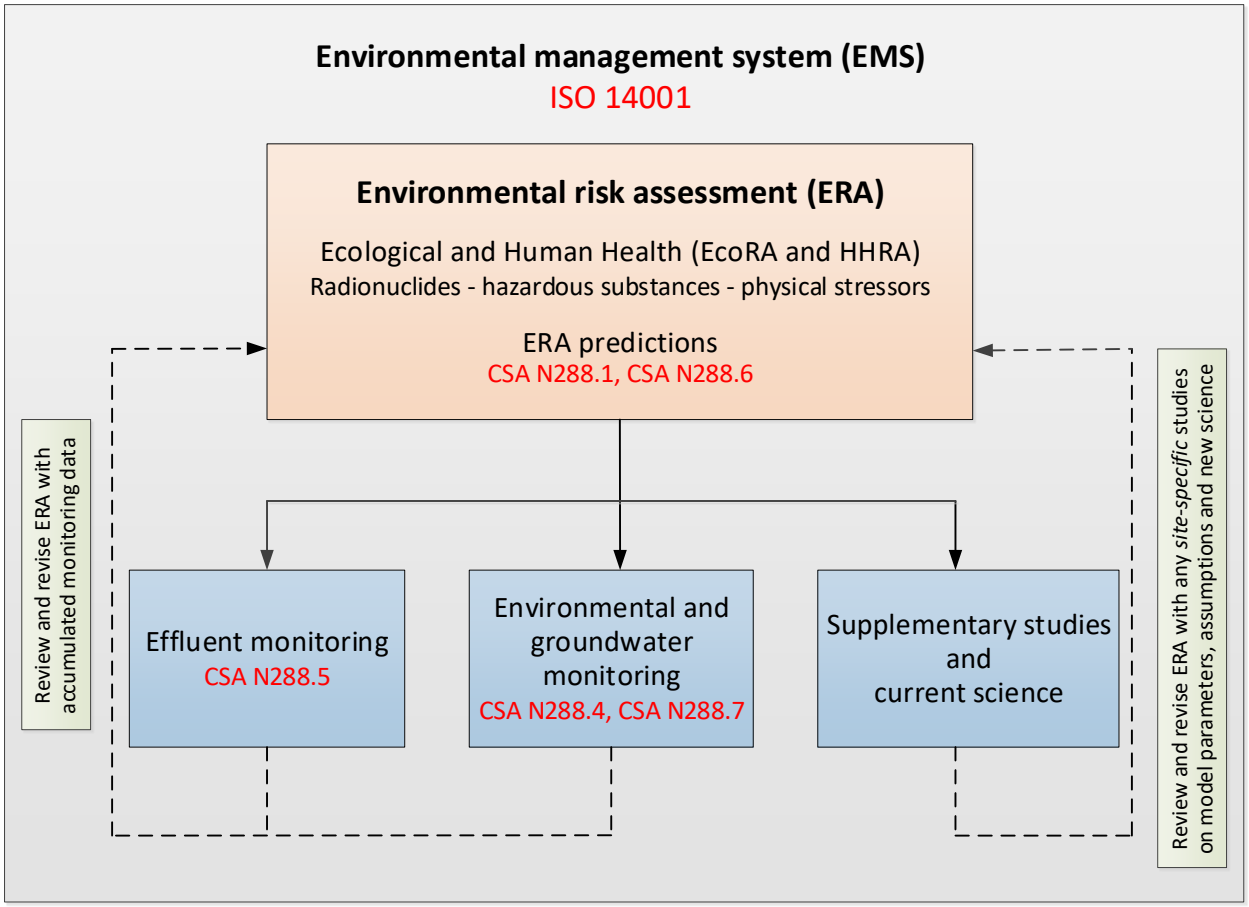


Figure 2 shows the cyclical nature of an ERA and how the ERA links to the effluent monitoring and environmental monitoring measures, illustrating how the ERA and the monitoring measures inform each other.

Figure 2: Interrelationships between the ERA and monitoring



The CNSC's regulatory framework for environmental protection:

- respects other federal and provincial environmental legislation
- applies the following standards in a graded approach, commensurate with risk:
  - CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* [4]
  - CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* [5]
  - CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6] (and, for further information on human exposure modelling, see CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* [3])

- CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* [7]
- CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* [1, 2]

These CSA standards apply to Class I nuclear facilities and uranium mines and mills. The CSA standards ensure that the risks associated with releases to the environment are continually assessed and mitigated; that releases are controlled and monitored; and that the environment is monitored. See section 4 for additional information on the application and implementation of these CSA standards, as well as other elements of environmental protection (for example, an environmental management system (EMS)).

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, the CNSC reviews every licence application to verify that there are no significant interactions with the environment (for example, for most Class II facilities, such as hospitals and universities, and for the use and transport of nuclear substances and radiation devices, there is no interaction with the environment). If the CNSC's review of the application determines that the facility or activity has potential interactions with the environment (such as planned releases of radioactive or hazardous substances to the environment) and that additional consideration of environmental protection measures is warranted, the applicant or licensee applies the information in section 4 to their environmental protection measures in a graded approach, commensurate with risk.

The CNSC also regulates many facilities and activities that do not have any interactions with the environment (that is, the facility or activity has no direct releases to the environment). A licence application that describes the nature of the proposed licensed activities is considered sufficient for ensuring protection of the environment, provided that CNSC staff conclude the facility or activities do not interact with the environment. In this case, the remaining information in this document does not apply to such facilities or activities.

Early engagement with CNSC staff is encouraged for facilities or activities with potential interactions with the environment. CNSC staff can provide facility- or activity-specific guidance to assist applicants and licensees.

2.3 Other jurisdictions and federal departments

The CNSC cooperates with other jurisdictions and federal departments to protect the environment. Where appropriate, the CNSC may enter into formal arrangements to increase the effectiveness of environmental protection. For example, the CNSC holds memoranda of understanding (MOUs) with other federal departments (such as Fisheries and Oceans Canada, Environment and Climate Change Canada). A complete list of MOUs is available on the CNSC's website.

When a proposed facility or activity must also comply with provincial or territorial legislation, the CNSC collaborates and coordinates the environmental protection processes where possible to increase efficiency and reduce duplication.

2.4 Public and Indigenous engagement

Participation opportunities for the public and for Indigenous groups are an important component of the CNSC's environmental reviews and licensing processes. The CNSC determines the appropriate level of participation opportunities on a case-by-case basis. The criteria include:

- interests of the public and Indigenous groups
- the complexity of the facility or activity and its potential interactions with the environment and the public
- additional factors such as other jurisdictional mandates or type of decision

For further information on the CNSC's expectations of licensees for public and Indigenous engagement, refer to:

- REGDOC-3.2.1, *Public Information and Disclosure* [9]
- REGDOC-3.2.2, *Indigenous Engagement* [10]

3. Environmental Reviews

The CNSC requires that the environmental effects of all nuclear facilities or activities be considered and evaluated when licensing decisions are made. All licence applications that demonstrate potential interactions with the environment are subject to an environmental review commensurate with the scale and complexity of the environmental risks associated with the facility or activity.

Early in the licensing process, CNSC staff determine which type of environmental review applies by considering the information provided by the applicant or licensee in their initial submission and supporting documentation. The information below outlines the different types of environmental reviews that may be applicable under the CNSC's current regulatory framework.

The CNSC ensures that the public has an opportunity to participate in the environmental review, and Indigenous consultation and engagement activities are integrated into the review process, to the extent possible.

3.1 Impact assessments under the *Impact Assessment Act*

Impact assessments are conducted on projects identified as having the greatest potential for adverse environmental effects in areas of federal jurisdiction, either listed as a "designated project" in the *Physical Activities Regulations* or as designated by the Minister of Environment. The scope of impact assessments subject to the *Impact Assessment Act* (IAA) includes the environmental, health, social and economic effects – both positive and negative – of a proposed project.

The Impact Assessment Agency of Canada (IAAC) leads the conduct of impact assessments for all designated projects subject to this legislation and works in collaboration with the CNSC to review projects that are also subject to regulation under the NSCA. Nuclear projects to be assessed under the IAA are subject to an integrated impact assessment that is carried out by a review panel. An integrated impact assessment means having a single assessment process with the shared objective that the requirements of both the IAA and the NSCA are discharged as "one project, one assessment".

A memorandum of understanding (MOU) established between the CNSC and the IAAC outlines the roles and responsibilities of each organization and helps guide collaboration into conducting integrated impact assessments under the IAA. The MOU confirms each organization's commitment to ensuring that the principle of "one project, one assessment" is followed in reviewing designated projects regulated by the CNSC, and that any reviews are conducted in an efficient and effective manner, without unnecessary delays or duplication of effort.

For more information, see:

- Impact Assessment Agency of Canada
- *Impact Assessment Act*
- MOU between the CNSC and the Impact Assessment Agency of Canada

3.2 Federal lands reviews under the *Impact Assessment Act*

Projects not listed in the *Physical Activities Regulations*, but proposed to be carried out on federal lands and requiring a decision by the CNSC as a federal authority, are subject to federal lands reviews under the IAA.

Upon receipt of a licence application for proposed activities to be carried out on federal lands, CNSC staff review the application and make a determination whether the proposal is subject to a federal lands review under the IAA. If a federal lands review is required, CNSC staff post a notice of this determination on the Canadian Impact Assessment Registry website, review the proposal according to the factors provided in section 84 of the IAA, and provide their recommendation to the Commission. The Commission is responsible to make the decision in determining whether the completion of the proposed project on federal lands is likely to cause significant adverse environmental effects.

The *Designated Classes of Projects Order* describes the classes of projects on federal lands that are designated by the Minister of Environment as causing only insignificant adverse environmental effects and that are, therefore, exempt from the federal lands requirements of the IAA.

The IAAC is developing further guidance and materials on federal lands reviews in collaboration with federal authorities, including the CNSC.

3.3 Ongoing environmental assessments under CEAA 2012

Projects with environmental assessments (EA) already initiated under the *Canadian Environmental Assessment Act (2012)* (CEAA 2012) and led by the CNSC will continue under their current processes as per the transition provision (section 182) of the IAA.

An EA under CEAA 2012 is carried out early in the licensing process (at the beginning of the project's lifecycle) and serves as a planning tool. The process for an EA under CEAA 2012 is described in appendix A.

The CNSC has in place *Generic Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012*. This document informs proponents of the information requirements for the preparation of an environmental impact statement (EIS) for a project that requires an EA under CEAA 2012. An EIS is a report written by a proponent that presents the technical studies and findings of an EA.

3.4 Environmental assessments under provincial regimes and land claim agreements

Some proposed nuclear projects may be subject to provincial EA legislation but not subject to the IAA. Also, in certain parts of Canada (for example, Yukon, Northwest Territories, Nunavut, parts of Quebec and parts of Newfoundland and Labrador), EA processes established under land claim agreements apply, and the IAA does not. In both cases, the CNSC acts as a technical advisor and is an active participant at all stages of the EA process; however, the CNSC has no role in making the EA decision. The Commission retains decision-making authority on licensing matters, and uses the information gathered in the EA process to inform its licensing decision under the NSCA. When multiple jurisdictions are involved, these processes are harmonized as much as possible to reduce duplication and promote efficiency.

3.5 Environmental protection reviews under the NSCA

The CNSC conducts environmental protection reviews (EPRs) for all licence applications with potential environmental interactions in accordance with its mandate under the NSCA to ensure the protection of the environment and the health of persons. An EPR is a science-based environmental technical assessment by CNSC staff as set out in the NSCA. Where there are

potential environmental interactions, an EPR under the NSCA is conducted for projects not subject to the IAA or other applicable EA legislation (described above).

An EPR describes the outcome of CNSC staff's review of licensing and environmental compliance activities conducted under the NSCA. This review serves to assess whether the applicant or licensee will, in carrying on a licensed activity, make adequate provision for the protection of the environment and health of persons. This assessment is commensurate with the scale and complexity of the environmental risks associated with the nuclear facility or activity.

An EPR under the NSCA is a component of the CNSC licensing and compliance verification process. It is carried out as part of the CNSC's review of all licence applications of facilities and activities that have potential interactions with the environment. CNSC staff assess the environmental and health effects of nuclear facilities and activities at every phase of the lifecycle or duration. At each phase (that is, for each licence application), CNSC staff consider all future phases of the lifecycle, taking into consideration all available information. As with all other safety and control areas (SCAs), an EPR under the NSCA is a process of ongoing verification related to the environmental protection SCA.

An EPR under the NSCA is primarily based on information that the applicant or licensee is required to submit to the CNSC through the established licensing process, such as the licence application and its supporting documentation, and information on environmental protection measures. An EPR under the NSCA is also based on compliance and technical assessment activities completed by CNSC staff (for example, reviews of annual environmental monitoring reports and environmental risk assessments). An EPR under the NSCA may also be supported by independent verification activities, such as the CNSC's independent environmental monitoring program (IEMP), as well as relevant regional health studies, monitoring programs and Indigenous knowledge studies.

Within a licensing process, the results of the EPR can be presented in a supporting report to accompany staff's licensing report to the Commission, or it can be reported directly in that staff licensing report (known as a Commission Member Document (CMD)). Outside of a licensing process, the results of the EPR can be presented in a stand-alone report that is posted on the CNSC website. An EPR report is intended for two key audiences – members of the public and Indigenous groups, and within the context of a licensing process, the Commission. The EPR report is prepared with the following objectives:

- publishing a clear report or section that provides transparency to the public and Indigenous groups on CNSC staff's technical assessment
- providing evidence-based information to inform the Commission's licensing decision (note that no decision is made on the EPR report itself)

4. Environmental Protection Measures

The necessary measures for environmental protection are determined on a facility- or activity-specific basis. **Note:** Not every facility or activity is required to have every environmental protection measure described in this section. The applicant or licensee may address certain requirements by demonstrating that a particular measure is not necessary or does not apply to that facility or activity. A licence application that describes the nature of the proposed licensed activities is considered sufficient for ensuring protection of the environment, provided CNSC staff conclude that the facility or activities do not interact with the environment.

4.1 Environmental risk assessment

An ERA is a systematic process that identifies, quantifies and characterizes the risk posed by contaminants (nuclear or hazardous substances) and physical stressors in the environment. It is a practice or methodology that provides science-based information to support decision-making and to prioritize the implementation of mitigation measures.

The applicant or licensee's ERA informs an environmental review. The ERA:

- identifies facility- or activity-specific characteristics and site-specific environmental characteristics
- identifies interactions between those characteristics
- assesses the likelihood and significance of these interactions and the resulting potential effects on the environment and the public

In conjunction with regulatory monitoring requirements, the ERA and its associated performance predictions serve as the basis for control and monitoring of releases, environmental monitoring, and any supplementary studies. All of these measures are interrelated and managed within the environmental management system (EMS). For additional information on an EMS, see section 4.6.

The initial ERA for a new facility or activity is based on best estimates of the facility- or activity-specific characteristics. These characteristics are combined with sufficient environmental characterization (such as baseline) to support the assessment of potential interactions with the environment and the potential for associated environmental effects.

The ERA uses the facility- or activity-specific estimates of physical disturbances and chemical releases (both nuclear and hazardous substances) to predict:

- the source terms of gaseous and liquid discharges
- the transport of nuclear and hazardous substances through the environment
- public exposure and dose
- exposure and effects on representative biota
- changes in habitat and effects on species that rely on that habitat

These predictions establish the basis for the CNSC's compliance program for that facility or activity.

The applicant or licensee incorporates the results of the initial ERA into their EMS, including the effluent and environmental monitoring measures. The predictions for physical disturbances and

releases, and the associated environmental behavior and potential effects, are measured and tested using site-specific monitoring.

The initial ERA submitted for licensing purposes for a new facility or activity is primarily predictive as it involves assessing the potential effects of a hypothetical facility or activity. As a facility or activity moves through its lifecycle, the ERA is periodically reviewed and revised (see section 4.1.2) using the accumulated site knowledge derived from operational experience, monitoring, special investigations, incorporation of advances in scientific knowledge and, where available, Indigenous traditional knowledge.

These "living" ERAs, which are informed by real data from monitoring programs (emissions, effluents, environmental) and current science, are used to assess if the original environmental impact predictions are exceeded or may be exceeded in the future. In this manner, the initial ERA evolves through the life of the facility or activity, remaining current and becoming an increasingly more powerful site-specific tool.

Requirements

For Class I facilities and uranium mines and mills, the licensee shall conduct an ERA in accordance with CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6].

The ERA shall be completed in a systematic, scientifically defensible manner that identifies, quantifies and characterizes the risk posed by releases of nuclear and hazardous substances and physical disturbances (stressors) on representative human and non-human biota. The licensee shall ensure that the ERA includes, as applicable to the facility or activity, both an ecological risk assessment (EcoRA) for the environment and a human health risk assessment (HHRA) for members of the public.

Guidance

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the licensee should use the ERA process described in CSA N288.6 [6] in a graded approach as appropriate to their circumstances. For many of these facilities, a simple screening assessment (as described in CSA N288.6) is adequate. **Note:** Although CSA N288.6 was developed for Class I facilities and uranium mines and mills, the methodology and general principles can be applied to other facilities and activities regulated by the CNSC.

Early engagement with the CNSC is encouraged for facilities and activities that are not specifically addressed by CSA N288.6 [6]. The CNSC can provide facility- or activity-specific guidance to assist licensees.

4.1.1 Complexity of the environmental risk assessment

Requirements

The applicant or licensee shall identify facility characteristics and activities that may interact with the environment during the relevant phase of the facility or activity's lifecycle (for example, site preparation, construction, operation and decommissioning).

This characterization shall include descriptions of facility- or activity-specific performance with respect to:

- physical disturbances (for example, footprint for surface structures, below-grade structures, diversions or flow alterations of surface or groundwater)
- emissions released to the environment
- effluents released to the environment

The facility or activity characterization shall be of sufficient detail to assess the potential for effects arising from the proposed maximum quantities and anticipated volumes and flow rates for releases associated with the facility or activity.

The applicant or licensee shall present a characterization of the baseline environment (that is, the environment before any development of the facility or activity has started) for any portion of the environment where the site characterization indicates potential for interaction.

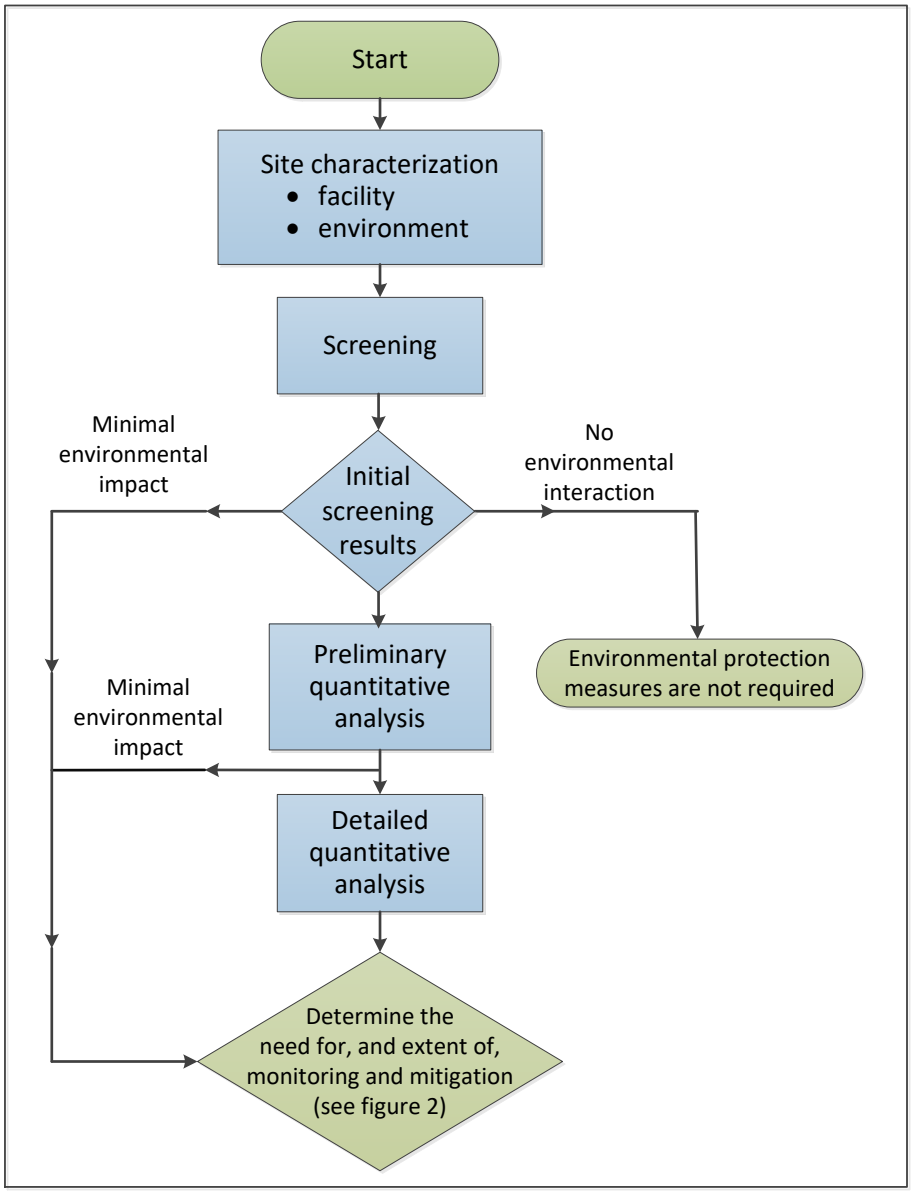
The applicant or licensee shall use the facility- or activity-specific characterization and the local environmental baseline characterization to identify the potential interactions between the facility or activity and the surrounding environment. Note that these identified interactions will become the focus of further stages within the ERA.

The applicant or licensee shall use the potential environmental interactions to support their justification as to the level of complexity for the ERA in accordance with CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6].

Guidance

ERAs may be completed in a tiered manner reflecting the complexity of the disturbances and releases associated with the facility or activity and with the complexity or sensitivity of the surrounding environment. This tiered approach allows the rapid completion of simple screening risk assessments for facilities or activities with limited interaction with the receiving environment or the public. However, it also allows for progressively more complex quantitative assessments for facilities or activities when warranted by the severity and the spatial and temporal extent of potential effects (see figure 3).

Figure 3: Tiered options for environmental risk assessments (simplified from CSA N288.6 [6])



Reviewing and revising the environmental risk assessment

Where an ERA exists, the licensee shall review and revise the ERA in accordance with CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6]; taking into consideration whether there has been:

- a significant change in the facility or activity that could alter the nature (type or magnitude) of the interactions with the environment (such as modification, expansion or refurbishment of the facility) within the ERA predictions
- any transition to a new phase in the lifecycle (such as a transition to licence to operate, decommission or abandon) where the application for the new licensing phase includes any interactions with the environment that were not previously captured in the ERA

The ERA shall be revised with site knowledge derived from:

- operational experience (for example, performance of mitigation measures such as effluent control systems)
- results of monitoring
- supplementary studies
- incorporation of recent developments in scientific knowledge

The revised ERA shall be used to assess the environmental performance of the facility or activity. The ERA shall also be used to predict continued future performance and associated environmental effects of the facility or activity.

If the revised ERA indicates that the nature, extent and significance of environmental effects are greater than predicted, the licensee shall:

- evaluate the environmental effects in terms of risk
- investigate mitigation measures as necessary
- identify any changes needed to the effluent and emissions monitoring measures resulting from any mitigation measures

4.2 Effluent and emissions control and monitoring

Controls on environmental releases are established to provide protection to the environment and to respect the principles of sustainable development and pollution prevention.

Requirements

The preventive and control measures shall be based on the potential risks to the environment that the facility or activity may pose.

The effluent and emissions control and monitoring shall:

- identify and document the infrastructure and activities (such as pipelines or storage) with the potential for significant accidental release to the environment of nuclear and hazardous substances and the barriers (such as primary and secondary containment, and liners) to prevent releases
- identify and document the points of release to the environment and the corresponding preventive control measures and equipment necessary to regulate and control the release of these nuclear and hazardous substances in the authorized manner
- estimate or measure, document and report the quality and quantity of releases to the environment
- verify the nature and quantity of releases against compliance criteria (such as authorized release limits), performance indicators (such as action levels) and the predictions of releases used as input parameters for the site-specific ERA
- evaluate mitigation measures to further control releases when the monitoring results identify deviations from the expected performance

4.2.1 Control of environmental releases

The effluent and emissions preventive and control measures are established on the basis of best industry practice, incorporating the application of BATEA, ALARA, process optimization, continuous improvement and the results of an ERA.

Guidance

A licensee's effluent and emissions control should address the following:

- BATEA assessment of pollution prevention and control technologies:
    - design and maintenance of engineered barriers between key waste streams and sources of nuclear and hazardous substances (for example, double-lined piping, secondary containment and sumps, waste rock pads and pond liners), with maintenance programs to ensure the integrity of these barriers
    - wastewater treatment systems (for example, precipitation and settling systems, ion-exchange columns, evaporators and membrane separation systems such as reverse osmosis) that minimize the contaminants released to surface waters from liquid effluent streams with maintenance programs to ensure the availability and performance of these systems
    - air pollution control technology systems (for example, HEPA filters, baghouse filters, wet/dry scrubbers, absorption/adsorption systems) that minimize air pollutants released to the environment via air emissions through stacks or as fugitive emissions from the facilities with maintenance programs to ensure the availability and performance of these systems

- BATEA assessment of techniques:
    - a focus on BATEA optimization; that is, the application of pollution prevention performance standards, design objectives and best practices to minimize or eliminate the release of nuclear or hazardous substances to the environment:
        - both operational and managerial practices that can influence the quality of releases to the environment (for example, upstream and downstream process optimization, adequate training of staff and effective overall management of the operation)
        - application and continual review of action levels as indicators of a potential loss of control of the site-specific environmental protection measures, to ensure the process is operating within its approved design specification and normal operating conditions
    - ALARA assessments (minimization-focused); that is, the application of radiation protection principles to effectively minimize human and environmental exposure to nuclear substances

- processes and procedures to ensure effective management of the effluent and emission control systems within an EMS (for example, maintenance of treatment systems, timely replacement of filters, calibration of monitoring equipment and procedures detailing appropriate responses to action level exceedances)

After the facility or activity is licensed, BATEA assessments of pollution prevention and control technologies for releases are necessary only where effects exceed, or may exceed, those identified in the ERA and adaptive management involving the modification or reduction of releases of specific nuclear or hazardous substances is indicated.

Assessments of techniques and the processes and procedures for ensuring effective effluent and emission control programs should be reviewed as part of the EMS requirement for continuous improvement.

4.2.2 Monitoring of releases to the environment

In conjunction with specific regulatory monitoring requirements, the ERA provides the technical foundation and structure for identifying the need for, and details of, effluent and emissions monitoring. The site-specific effluent and emissions monitoring is designed using the characterization of the locations, the anticipated volume, chemistry and flow rate of releases, and the proposed maximum quantities and concentrations of nuclear and hazardous substances (including their physical, chemical and radiological characteristics).

For facilities and activities with no significant measurable releases to the environment, effluent and emissions monitoring is not required. In such cases, the licensee should demonstrate (through engineering or scientific methods) that appropriate barriers and practices are in place, and are monitored and maintained to prevent releases to the environment.

For facilities and activities where the releases are of low risk or quantities are too low or too difficult to measure, monitoring is not required. The licensee may estimate emissions based on site-specific process chemistry and engineering principles.

Requirements

For Class I nuclear facilities and uranium mines and mills, the effluent and emissions monitoring shall address the requirements in CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* [5].

The effluent and emissions monitoring shall be designed and implemented:

- to demonstrate compliance with authorized release limits
- to respond to any action levels or other performance indicators, internal objectives or targets set on releases for effluent control
- to confirm the adequacy of controls on releases from the source
- to provide supportive data required to assess the level of risk on human health and safety and potential effects on the environment as determined by the ERA or regulation

In addition, the licensee shall ensure that the effluent and emissions monitoring:

- demonstrates that controlled releases to water frequented by fish are not acutely lethal
- supports and assesses the adequacy of any adaptive management measures

For Class I nuclear facilities and uranium mines and mills, the applicant or licensee shall assess and document the need for action levels. The applicant or licensee shall engage with CNSC staff on the requirements for establishing and implementing action levels for releases to the environment.

For facilities and activities subject to the *Uranium Mines and Mills Regulations*, the licensee shall develop a facility-specific code of practice that includes, where appropriate, action levels for releases of nuclear and hazardous substances to the environment.

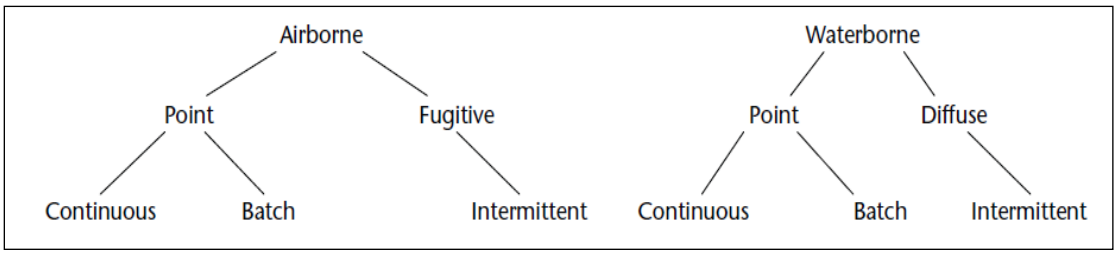
The applicant or licensee shall assess for acute lethality any effluents that are released to water frequented by fish and that contain hazardous substances that could be considered deleterious under the *Fisheries Act*. Meeting existing federal or provincial requirements for toxicity testing shall be considered as satisfying this requirement. Otherwise, the method(s), frequency of testing and actions to be implemented as a result of a test failure shall be developed during licensing and shall be informed by existing standard practices applied to other industrial sectors.

Guidance

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the licensee should use the process described in CSA N288.5 [5] in a graded approach as appropriate to their circumstances. **Note:** Although CSA N288.5 [5] was developed for Class I facilities and uranium mines and mills, the methodology and general principles can be applied to other facilities and activities regulated by the CNSC.

The measurement and evaluation of environmental releases are key to verifying the efficacy of preventive and control measures. The overall process should include feedback mechanisms (both periodic and continual) to assess and implement actions to achieve performance targets. Monitoring should be conducted on a temporal scale relevant to the nature and complexity of the release (such as intermittent, continuous or batch), and should use a standard sampling methodology (or a non-standard methodology approved by CNSC staff) that is appropriate for the type of release (see figure 4).

Figure 4: Types of releases that may be associated with a nuclear facility or activity that can influence sampling methodology and frequency (CSA N288.5 [5])



Effluent and emission monitoring addresses both the nature and quantities of releases of nuclear and hazardous substances (including wastes). Performance indicators for operational control, such as action levels (where required), should be established to serve as early indicators of potential loss of control or deviation from expected quality or quantity of releases. Performance indicators should be designed to initiate investigation of abnormal situations and, if necessary, result in corrective measures. Measurement and evaluation should be coordinated to permit timely corrective action.

For facilities and activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, licensees should consider incorporating the development of similar environmental performance indicators, such as action levels, in their effluent and emission monitoring.

4.3 Environmental monitoring

Environmental monitoring consists of a risk-informed set of integrated and documented activities to sample, measure, analyze, interpret and report one or all of:

- the concentration of nuclear and hazardous substances in environmental media to assess one or both of:
  - the exposure of receptors to those substances
  - the potential effects on human health, safety and the environment
- the intensity of physical stressors and/or their potential effect on human health and the environment
- the physical, chemical and biological parameters of the environment normally considered in the design of the environmental monitoring necessary to support the interpretation of the results; some examples are supportive data for transport (such as wind velocity) or toxicity assessment (such as organic carbon or hardness) or measurements at reference stations (where incorporated in the monitoring)

Requirements

For Class I nuclear facilities and uranium mines and mills, the licensee shall ensure that the environmental monitoring addresses CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* [4].

The licensee shall use applicable regulatory monitoring requirements and the ERA to identify the need for and complexity of the environmental monitoring. The licensee shall provide justification to support whether ERA-derived environmental monitoring is required. In the justification, the licensee shall address:

- characteristics of the licensed facility or activity
- characteristics of the surrounding environment
- nuclear and hazardous substances and physical stressors
- receptors that can be affected
- spatial extent of potential exposures
- severity, probability, and spatial and temporal extent of any potential biological effects

The licensee shall ensure that the environmental monitoring measures, plans and data provide sufficient information to assess exposure or potential effects on human health and the environment due to releases or physical perturbations resulting from the facility or activity.

The licensee shall ensure that the results of the environmental monitoring are used to confirm that the effects on the environment are within the licensing predictions and adequate provisions are in place to protect the environment.

Guidance

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the licensee should use the process described in CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* [4] in a graded approach, as appropriate to their circumstances. **Note:** Although CSA N288.4 [4] was developed for Class I facilities and

uranium mines and mills, the methodology and general principles can be applied to other facilities and activities regulated by the CNSC.

Monitoring for the presence of stressors (physical stressors or nuclear and hazardous substances) in the environment is sometimes more informative than monitoring the release at the source. The practice of monitoring ambient air quality is common for atmospheric emissions, especially fugitive or diffuse emissions (such as radon from ore pads).

The results of the environmental monitoring should:

- be used to validate the predictions related to transport of nuclear and hazardous substances through the environment and the magnitude and extent of any effects predicted in the site-specific ERA to determine if the facility or activity continues to operate within its predicted environmental performance
- be periodically reviewed (in conjunction with the periodic revision and update of the ERA) as to its adequacy for testing the environmental predictions
- be modified as necessary to support and assess the adequacy of any adaptive management measures

Environmental monitoring may involve three basic types of monitoring objectives (see CSA N288.4 [4]):

- pathways monitoring
- biological effects monitoring
- supplementary studies

Pathways monitoring is the most common form of monitoring. It involves sampling and analyzing abiotic and biotic media that lie along the pathways connecting a source (that is, a release from a facility or activity) to a receptor (such as non-human biota or the public) to determine the concentration or level of a contaminant or physical stressor in that medium. This data, combined with environmental transfer parameters that describe the movement of contaminants or physical stressors through the environment, may be used to assess the exposure of the receptor. Some examples of the most common sampling media are:

- components of air, water, soil and sediment
- vegetation consumed by herbivorous receptors
- tissues of prey animals consumed by carnivorous receptors
- foodstuffs consumed by humans

Such environmental monitoring is only necessary for those facilities or activities where the releases have the potential to be measurable within the environment. The monitoring details, with respect to the analytes being measured (physical stressors, nuclear and hazardous substances) and the media to be sampled (air, water, and so on), are dependent on the scale and complexity of the risks associated with the facility or activity.

Biological effects monitoring is used to detect actual measurable biological responses of organisms to exposure to the stressor. For regulatory purposes, responses at the individual, population or community level of biological organization are considered to be more relevant as

indicators of ecological effects. Some examples of biological effects monitoring that may be relevant depending on the risk posed by the facility or activity include:

- toxicity testing using exposure media (such as effluent receiving waters or exposed sediments)
- fish health and population indicators (such as gonadal somatic index and egg production)
- monitoring of plant or benthic invertebrate community composition (benthic invertebrates or plants)

Supplementary studies may be conducted to achieve specific well-defined objectives such as:

- providing the data required to reduce uncertainty and confounding factors in the ERA
- increasing knowledge of the behavior of contaminants and physical stressors in the environment (for example, refining environmental transfer parameters)
- investigating monitoring results that indicate potential deviation from the transport or effects predictions in the ERA or the licensing basis

4.4 Public dose

Radiological releases to the environment are controlled and monitored by the effluent and emissions control and monitoring and the environmental monitoring. Results of these monitoring and control activities are used to determine dose to members of the public.

A human health risk assessment (HHRA) is completed as a sub-element of an ERA for both nuclear and hazardous substances.

Requirements

The *Radiation Protection Regulations* define prescribed dose limits for workers and members of the public, and require doses to be monitored by direct measurement or by estimation of the quantities and concentrations of any nuclear substance released as a result of a licensed activity.

The *Radiation Protection Regulations* require licensees to implement a radiation protection program for protection of the public. The focus for radiation protection within the environmental protection framework is on radiological protection of the environment and the public.

Guidance

The development of a radiation protection program should be based on a sound policy, strategy and method for radiation protection and the achievement of ALARA, while taking into consideration the pathways and critical groups identified in the derived release limits (DRL) document (CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* [3]).

The licensee should design the radiation protection program commensurate with the radiological hazards associated with the licensed activities, based on an ERA and including radiation exposure and dose assessments.

4.5 Groundwater protection and monitoring

Groundwater protection is a specialized element of the overall environmental protection measures. As groundwater flow and associated contaminant transport can be more difficult to

detect and delineate than that of surface water, specific requirements and guidance are provided here.

Groundwater protection is an inter-related system of initiatives, processes and activities with the overall goal of protecting the quality and quantity of groundwater by minimizing interactions with the environment from activities associated with a nuclear facility, allowing for effective management of groundwater resources.

Requirements

For Class I nuclear facilities and uranium mines and mills, the licensee shall ensure that the need for and design of groundwater protection programs and associated monitoring address CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* [7].

The applicant or licensee shall implement a groundwater protection program in a graded approach, appropriate to their circumstances, to:

- prevent or minimize releases of nuclear or hazardous substances to groundwater
- prevent or minimize the effects of physical stressors on groundwater end uses
- confirm that adequate measures are in place to stop, contain, control and monitor any releases and physical stressors that can occur under normal operation

Guidance

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the applicant or licensee should implement a groundwater protection program and associated monitoring program in accordance with CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* [7] in a graded approach as appropriate to their circumstances. **Note:** Although CSA N288.7 [7] was developed for Class I facilities and uranium mines and mills, the methodology and general principles can be applied to other facilities and activities regulated by the CNSC.

Groundwater protection programs are developed on a site-specific basis and should consider the following elements:

- identification of sources of contaminants of concern
- investigation of releases under normal operation and source characterization
- site characterization
- assessment of groundwater end-use
- assessment of groundwater vulnerability
- development of a groundwater monitoring program
- risk management (as required)

4.6 Environmental management system

An environmental management system (EMS) refers to the management of an organization's environmental policies, measures and procedures in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for

developing, implementing and maintaining policy for environmental protection and for continuous improvement by:

- identifying and managing environmental risks associated with a facility or activity (see section 3 and section 4.1)
- the identification, implementation and maintenance of pollution control activities and technologies (see section 4.2.1)
- monitoring of releases (see section 4.2.2)
- monitoring of contaminants and for their potential effects in the environment (see section 4.3)

In addition, the EMS should address environmental emergency preparedness.

The EMS serves as the management tool for integrating all of the applicant or licensee's environmental protection measures in a documented, managed and auditable process by:

- identifying and managing non-compliances and corrective actions within the activities, through internal and external inspections and audits
- summarizing and reporting the performance of these activities, both internally (licensee's management structure) and externally (to the Commission and the public)
- training of the personnel involved in these activities
- ensuring the availability of resources (such as qualified personnel, organizational infrastructure, technology and financial resources)
- defining and delegating roles, responsibilities and authorities essential to effective environmental management

The EMS may be implemented within the licensee's integrated management system.

Requirements

For Class I nuclear facilities and uranium mines and mills, the licensee shall manage their environmental protection measures within an EMS that reflects the nature and complexity of their environmental protection measures.

The licensee shall:

- establish, implement and maintain an EMS that meets the requirements set by CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* (2004 edition or successor editions) [1, 2]
- ensure that the scope of the EMS is consistent with the definition of environment, environmental effects and pollution prevention provided in the glossary of this regulatory document
- conduct internal audits at planned intervals so that all elements of the EMS are audited on at least a five-year cycle
- conduct an annual management review

Guidance

For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the

applicant or licensee should manage their environmental protection measures within an EMS that reflects the nature and complexity of their environmental protection measures.

In addition to the information provided in this regulatory document, the licensee should refer to the following documents:

- CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* (2004 edition or successor editions) [1, 2]
- CAN/CSA ISO 14004, *Environmental Management Systems – General Guidelines on Principles, Systems and Support Techniques* [11]

Note: The CNSC does not consider certification to CAN/CSA ISO 14001 by an authorized registrar or other independent third party as solely sufficient for demonstrating compliance with the requirements. The CNSC evaluates all activities in relation to the requirements of this regulatory document. The CNSC's compliance verification focuses on the effectiveness of the EMS rather than on the licensee's adherence to CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2].

During the design of an EMS, the ISO documents provide guidance and information that may be useful; however, the licensee should note that, as a federal agency, the CNSC has adopted certain key concepts in environmental protection from other federal statutes. Where applicable, the CNSC expects licensees to apply the more-demanding meanings from federal legislation in the scope of their EMS.

To avoid misinterpretation of these concepts, the licensee should review the following differences between key concepts in federal legislation and those in CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2] and consider them in the scope of their EMS:

- the CNSC's definitions of environment, environmental effect (i.e., impact) and pollution prevention (i.e., prevention of pollution) in this regulatory document are taken from federal legislation and are broader than the definitions of the related terms in CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2]
- in both the NSCA and the *Canadian Environmental Protection Act, 1999* (CEPA 1999), risk is a key concept in environmental protection that is not addressed in CAN/CSA ISO 14001 [1, 2]
- the licensee should use the ERA as one of the core sources to inform the significant environmental aspects and effects of the EMS
- CAN/CSA ISO 14001 [1, 2] provides only minimal guidance on the interpretation of adverse environmental effects

Pollution prevention is the key principle underlying the management of hazardous substances in Canada. Section 64 of CEPA 1999 defines the nature of toxic substances, explicitly defining unreasonable risk for certain scheduled substances. For other potentially hazardous substances that are not subject to legislation, unreasonable risk may be interpreted in terms of likely significant adverse effects. This concept is nearly equivalent to the CAN/CSA ISO 14001 [1, 2] concept of significant environmental effects. In the CNSC licensing process for Class I nuclear facilities and uranium mines and mills, the process for an EPR under the NSCA or an impact assessment under the *Impact Assessment Act* provides an initial framework for identifying and assessing the equivalent of ISO-significant environmental aspects in an appropriate context. This information can provide the initial foundation for the scope of the EMS.

For nuclear substances, the *Radiation Protection Regulations* require exposure and doses to persons to be managed according to the ALARA (as low as reasonably achievable) principle, while taking social and economic factors into account. G-129, *Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable (ALARA)"* [8] provides additional information.

The *Radiation Protection Regulations* define risk for workers and the public through prescribed dose limits, and require doses to be monitored by direct measurement or by estimation of the quantities and concentrations of any nuclear substance released as a result of the licensed activity.

The EMS framework should cover the assessment of releases and potential effects, the measures to control releases of nuclear substances and hazardous substances into the environment, and the measures taken to prevent or mitigate potential effects.

The framework should be appropriate for the type of facility or activity and the licensing phase, and should be commensurate with overall regulatory requirements. In addition to the environmental protection measures described in detail earlier, the EMS should address environmental emergency preparedness.

4.6.1 Environmental emergency preparedness

The licensee should address environmental emergency preparedness and response in terms of:

- the proposed measures to prevent or mitigate the effects of accidental releases of nuclear and hazardous substances on the environment
- the proposed measures to ensure the availability and accessibility of environmental monitoring instrumentation during emergencies
- the inclusion of environmental monitoring instrumentation and equipment layouts in emergency plans

The licensee should address reporting requirements for potential or real emergency situations.

For additional guidance, refer to REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response* [12].

4.6.2 Other considerations

The licensee should describe elements of the EMS related to worker training or qualifications, and the environmental protection obligations of workers. The licensee should demonstrate how training programs will enable workers to meet their obligations with respect to environmental protection.

Appendix A: Environmental Assessments Under CEAA 2012

Note: Projects with environmental assessments (EA) already initiated under the *Canadian Environmental Assessment Act (2012)* (CEAA 2012) and led by the CNSC will continue under their current processes, as per the transition provision (section 182) of the IAA. The following appendix is relevant to those ongoing projects and will remain in this regulatory document for reference purposes until those projects are completed.

The CNSC ensures that the environmental assessment (EA) requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) are met for designated projects (described in CEAA 2012) that are regulated under the *Nuclear Safety and Control Act* (NSCA).

An EA under CEAA 2012:

- predicts the environmental effects of a proposed designated project
- identifies mitigation measures
- assesses whether the proposed project is likely to cause significant adverse environmental effects, taking into account the identified mitigation measures
- ensures a follow-up program is developed to verify the accuracy of the EA predictions under CEAA 2012 and the effectiveness of any mitigation measures

An EA conducted under CEAA 2012 is a planning tool. It is carried out early in the licensing process (before any licence is granted) and considers the entire proposed lifecycle of a project. An EA under CEAA 2012 includes information prepared by the applicant and CNSC staff, as well as comments received from Indigenous groups and the public. After reviewing the EA, the Commission determines if the proposed project is likely to cause significant adverse environmental effects, taking into consideration the implementation of mitigation measures.

In accordance with paragraph 15(a) of CEAA 2012, the CNSC is the sole federal responsible authority (RA) for conducting an EA for designated projects regulated under the NSCA and described in the *Regulations Designating Physical Activities*, as follows:

> "31 The construction, operation and decommissioning of a new uranium mine or uranium mill on a site that is not within the licensed boundaries of an existing uranium mine or uranium mill.
>
> 32 The expansion of an existing uranium mine or uranium mill that would result in an increase in the area of mine operations of 50% or more.
>
> 33 The construction, operation and decommissioning of a new
>
> (a) facility for the processing, reprocessing or separation of an isotope of uranium, thorium, or plutonium, with a production capacity of 100 t/year or more;
>
> (b) facility for the manufacture of a product derived from uranium, thorium or plutonium, with a production capacity of 100 t/year or more; or
>
> (c) facility for the processing or use, in a quantity greater than 10^{15} Bq per calendar year, of nuclear substances with a half-life greater than one year, other than uranium, thorium or plutonium.
>
> 34 The expansion of an existing
>
> (a) facility for the processing, reprocessing or separation of an isotope of uranium, thorium or plutonium that would result in an increase in production capacity of 50% or more and a total production capacity of 100 t/year or more;

(b) facility for the manufacture of a product derived from uranium, thorium or plutonium that would result in an increase in production capacity of 50% or more and a total production capacity of 100 t/year or more; or

(c) facility for the processing or use, in a quantity greater than 10^{15} Bq per calendar year, of nuclear substances with a half-life greater than one year, other than uranium, thorium or plutonium, that would result in an increase in processing capacity of 50% or more.

35 The construction, operation and decommissioning of a new nuclear fission or fusion reactor.

36 The expansion of an existing nuclear fission or fusion reactor that would result in an increase in power output of 50% or more.

37 The construction and operation of a new

(a) facility for the storage of irradiated fuel or nuclear waste, on a site that is not within the licensed perimeter of an existing nuclear facility; or

(b) facility for the long-term management or disposal of irradiated fuel or nuclear waste.

38 The expansion of an existing facility for the long-term management or disposal of irradiated fuel or nuclear waste that would result in an increase in the area, at ground level, of the facility of 50% or more."

The Minister of Environment and Climate Change Canada may also designate a physical activity that is not prescribed by the *Regulations Designating Physical Activities* if the project may cause adverse environmental effects or if there are public concerns related to those effects.

For these designated projects:

- the CNSC must make an EA decision in accordance with section 52 of CEAA 2012 before a regulatory decision can be made under the NSCA to allow the project to proceed
- if the CNSC determines that the project is not likely to cause significant adverse environmental effects in accordance with subsection 52(1) of CEAA 2012, then in accordance with section 53 and through the licensing process, the CNSC establishes the mitigation measures and, where applicable, follow-up activities that the applicant must implement
- if the CNSC determines that the project is likely to cause significant adverse environmental effects, then in accordance with section 52(2) of CEAA 2012, the CNSC will refer to the Governor in Council the matter of whether those effects are justified in the circumstances

Licensing, compliance and verification activities undertaken by CNSC staff ensure that the applicant has implemented the mitigation measures identified in the EA. Where applicable, the licensing, compliance and verification activities will also be used to ensure the implementation of a follow-up program.

If an applicant proposes to carry on an activity following the completion of an EA under CEAA 2012, the applicant must complete the CNSC licensing process, including safety and control measures for protection of the environment and of the health and safety of persons.

A.1 Environmental assessment under CEAA 2012 conducted by the CNSC

The applicant chooses whether to complete an EA under CEAA 2012 via an integrated approach with the CNSC licensing process, or a sequential approach.

Under an integrated approach, the EA is conducted at the same time as the review of the information in the applicant's licence application, enabling CNSC staff to present their recommendations for the EA and the licence application to the Commission at the same Commission proceeding (for example, a meeting, a hearing or an abridged hearing).

Under a sequential approach, the EA is conducted first, with a subsequent review of the licence application. This approach may be more appropriate when, for example, an applicant uses the EA to assess the feasibility of a project.

Note:

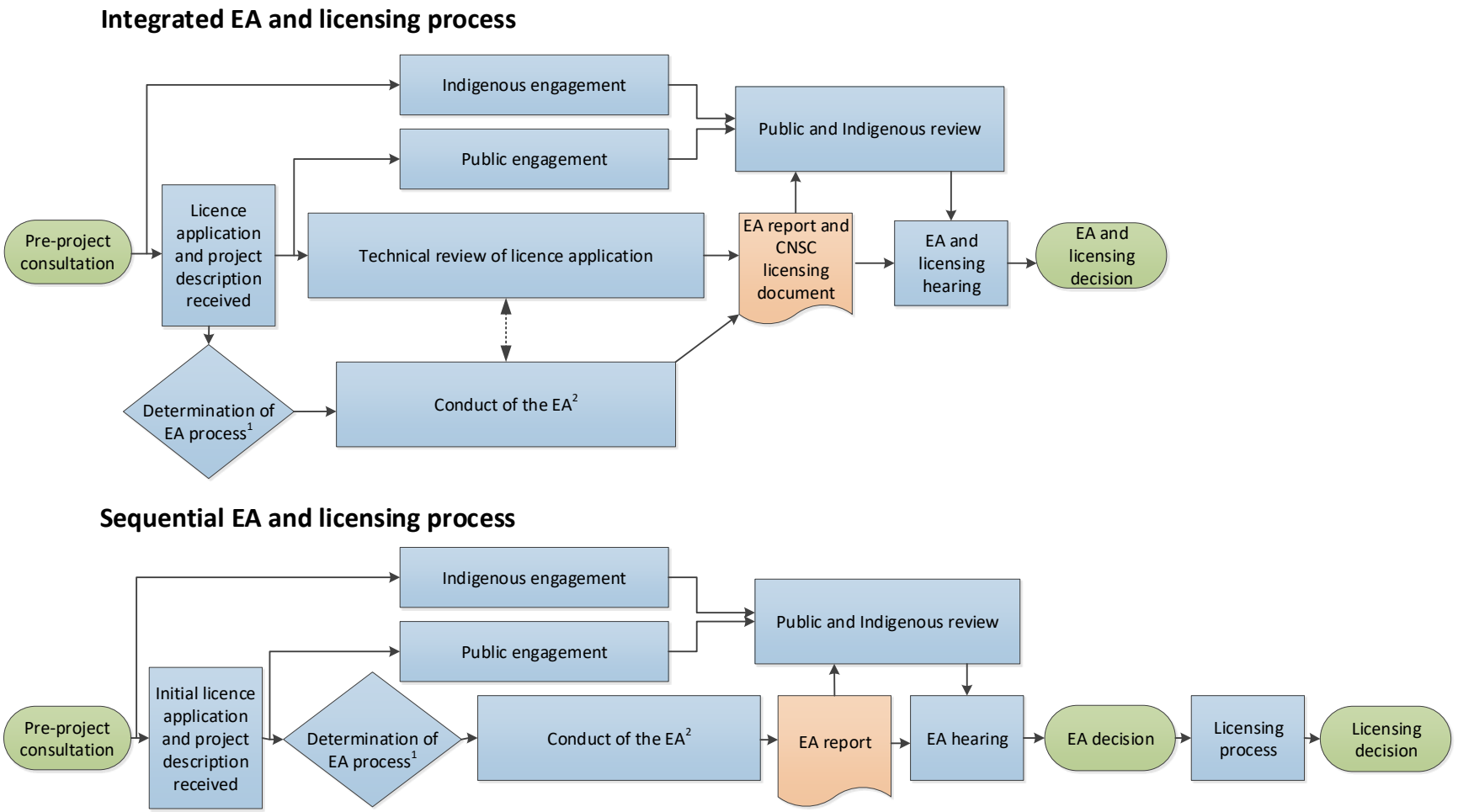
- after the EA is completed, the applicant is responsible for submitting all remaining documentation to fulfill the CNSC's licensing requirements to undertake project activities
- if sufficient time elapses between the EA decision and the submission of the corresponding licence application that there is new science and/or technology, new policy, changes in the environment, or any project modifications with a potentially different impact on the environment, CNSC staff may require the applicant to update the previous EA information to take into account these additional considerations

CEAA 2012 does not set regulated timelines for EAs conducted by the CNSC. However (pursuant to the *Class I Nuclear Facilities Regulations* and the *Uranium Mines and Mills Regulations*), the CNSC is committed to completing this process within the 24-month federal timeline for a licensing decision under the integrated approach. Furthermore, CNSC staff's service standard for completing an EA under CEAA 2012 under a sequential approach is also a 24-month federal timeline. Adherence to this schedule, for both integrated and sequential approaches, is facilitated by the completeness of information received from applicants, and the process will begin when the notice of commencement is posted.

Note: The 24-month federal timeline applies to CNSC activities, and not to the time periods required for steps outside the CNSC's control, such as time the applicant needs to prepare technical studies or to respond to requests for additional information or circumstances that are specific to the project.

Figure 5 and table A outline the CNSC's process for completing an EA under CEAA 2012.

Figure 5: Overview of the environmental assessment process under CEAA 2012, using an integrated or sequential approach



[1] If the project is not listed in the *Regulations Designating Physical Activities*, then an environmental protection review under the NSCA will be carried out (refer to section 3).
[2] The CNSC may delegate the conduct of the EA or any part thereof to another jurisdiction. In such cases, the responsibility for making a decision under CEAA 2012 remains with the Commission.

Table A: Key steps for an environmental assessment under CEAA 2012

Step	Action
Step 1	Applicant conducts pre-project engagement with the CNSC
Step 2	Sequential approach: Applicant submits a project description and initial licence application Integrated approach: Applicant submits a project description and licence application
Step 3	CNSC staff determine if an EA under CEAA 2012 is required
Step 4	CNSC staff define participation opportunities
Step 5	Commission determines the scope of the EA
Step 6	Applicant conducts technical studies and submits the environmental impact statement (EIS)
Step 7	CNSC staff perform a technical review of the EIS
Step 8	CNSC staff draft and issue the EA report
Step 9	Commission proceeding (meeting, hearing or abridged hearing) on the EA report

Note: Public and Indigenous group participation opportunities, carried out by both the CNSC and the applicant, occur throughout this process.

A.2 Key steps for an environmental assessment under CEAA 2012

The process for an EA conducted by the CNSC under CEAA 2012 includes the following key steps.

Step 1: Applicant conducts pre-project engagement with the CNSC

Applicants may begin to determine the feasibility of a project before submitting a project description and (for an integrated approach) a licence application. Early communication with the CNSC is recommended, to help applicants:

- identify projects that must undergo an EA in accordance with CEAA 2012
- understand the regulatory requirements
- understand the CNSC's EA and licensing processes (that is, an integrated EA compared to a sequential EA) and the associated anticipated timelines
- clarify the information to be included in the project description
- identify the potential involvement of other jurisdictions
- identify Indigenous groups whose Indigenous or treaty rights may be affected or Indigenous groups with an interest in the project
- determine the appropriate level of public and Indigenous engagement activities

To facilitate planning, the CNSC encourages applicants and licensees to submit their project descriptions as early as possible.

The CNSC may allow some applicants to apply a graded approach to the requirements for a project description as set out in the *Prescribed Information for the Description of a Designated Project Regulations*. This possibility should be discussed and determined during pre-project engagement.

For early engagement and planning purposes, the CNSC may initiate early discussions with other federal, provincial or territorial authorities and Indigenous groups as soon as an applicant indicates their intent to seek regulatory approval for a proposed project. The objective of early engagement is to support a more timely and efficient process for the EA under CEAA 2012. For more information, see step 4, below.

Step 2: Applicant submits a project description and/or licence application

For a sequential approach applied to a proposed new facility (that requires a new licence application), the applicant submits **both** of the following:

- a project description that provides the information set out in the *Prescribed Information for the Description of a Designated Project Regulations*
- an initial licence application with the necessary information needed to start the EA process, and a schedule for submission of the remaining material

For a sequential approach applied to an existing facility with proposed new activities (that requires a licence amendment), the applicant submits a project description only.

For an integrated approach, the applicant submits **both** of the following:

- a project description that provides the information set out in the *Prescribed Information for the Description of a Designated Project Regulations*
- a licence application

The CNSC may request additional information, even if the project description generally conforms to these regulations, as required to complete the EA determination.

Step 3: CNSC determines if an EA under CEAA 2012 is required

A nuclear project undergoes an EA under CEAA 2012 if it meets the description of a designated project in the *Regulations Designating Physical Activities* or if it has been designated by the Minister of Environment and Climate Change Canada. Using the information provided in the project description, the CNSC determines if the project is a designated project, and completes an EA determination memorandum that documents the findings.

If an EA under CEAA 2012 is required, the CNSC informs the applicant.

If an EA under CEAA 2012 is not required, the applicant must still meet CNSC licensing requirements before the licence is issued, including submission of information that allows CNSC staff to conduct an EA under the NSCA to ensure the applicant or licensee will, in carrying out the project, ensure the protection of the environment and of the health of persons, as described in section 3.

For an EA under CEAA 2012:

- As the sole federal responsible authority for nuclear projects, the CNSC contacts provincial jurisdictions to determine if there are any other provincial EA requirements. Where applicable, the CNSC works with other jurisdictions to determine if their EA requirements can be addressed through a single EA process (to reduce duplication and provide regulatory efficiency). Relevant federal and provincial EA agreements provide direction regarding jurisdictional roles and responsibilities in the assessment of such projects.

- The CNSC may delegate the conduct of an EA or any part thereof to another jurisdiction. In such cases, the responsibility for making a decision under subsection 52(1) of CEAA 2012 remains with the Commission. Delegation of EA-related matters for a given project are determined on a case-by-case basis in accordance with section 26 of CEAA 2012.

- The CNSC contacts other federal authorities to determine if additional regulatory decisions are required to allow the project to proceed. The CNSC also engages the appropriate federal authorities to determine whether they can provide specialist or expert information or knowledge to support the conduct of the EA.

- The CNSC ensures that a notice of commencement of an EA is posted on the Canadian Environmental Assessment Registry (CEAR). This notice provides a brief description of the project, the jurisdictions involved, and CNSC contact information. The CNSC posts a similar notice on the CNSC website, and provides a link to the notice of commencement on CEAR. The CNSC also distributes the notice to its subscription list and sends a formal notice to identified Indigenous groups.

Step 4: Defining participation opportunities

Indigenous consultation activities are integrated in the EA process to the extent possible. For more information, see REGDOC-3.2.2, *Indigenous Engagement* [10].

The CNSC ensures that the public is provided with an opportunity to participate in the EA. The breadth and timing of public participation is at the discretion of the CNSC. For example, a public review period may be conducted on the project description to solicit the views of the public, Indigenous groups and other stakeholders to help inform the conduct of the EA under CEAA 2012. Other opportunities could include public outreach sessions (such as open houses or information sessions); a public review on documentation (such as the environmental impact statement (EIS) or EA report); or participation in a public hearing on the EA.

Step 5: Determining the scope of the EA

Under subsection 19(1) of CEAA 2012, the CNSC is required to consider certain factors in the EA under CEAA 2012 (see subsection A.3). The Commission determines the scope of these factors in a Commission proceeding.

CNSC staff will notify the applicant of the final scope of factors determined by the Commission, including any additional requirements that are to be included in the conduct of the technical studies and EIS.

Step 6: Applicant conducts technical studies and submits the EIS

The conduct of the technical studies and preparation of an EIS are typically delegated to the applicant. The document *Generic Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012* [13] informs applicants of the information requirements for the preparation of an EIS for a project that requires an EA under CEAA 2012.

The applicant submits the EIS and any supporting technical studies to the CNSC for a technical review.

Note: To meet CEAA 2012 requirements, the applicant should complete a baseline environmental characterization (see appendix B), and an environmental effects characterization (see appendix C). Specific requirements under CEAA 2012 are described in subsection A.3.

Step 7: Technical review of the EIS

CNSC staff and, where applicable, other federal and provincial authorities perform an in-depth technical review of the EIS and supporting technical studies. If certain areas need to be clarified, confirmed or improved based on the technical review, the CNSC may ask the applicant to provide additional information to resolve these issues.

When CNSC staff are satisfied that the applicant has adequately addressed all information gaps, the technical review is considered to be complete.

Step 8: EA report

The CNSC must ensure that an EA report is prepared. The EA report includes CNSC staff's conclusions regarding the potential environment effects, the proposed mitigation measures, and whether the project is likely to result in significant adverse environmental effects, as well as follow-up program requirements.

CNSC staff draft the EA report, which synthesizes the applicant's technical information and takes into account the results of the technical review, including any comments received from other parties.

The CNSC may request other federal agencies to review the EA report or to provide expert information or knowledge. Comments received will be considered in the development of the EA report.

Step 9: Commission proceeding on the EA report

CNSC staff prepare a document summarizing the EA report's conclusions and recommendations, and outlining the EA-related decisions that the Commission needs to make. This document and the EA report are submitted to the Commission, along with any public comments received (including how the CNSC staff addressed the comments). The Commission uses this information to inform its decision.

For public hearings, a notice of public Commission hearing is posted on the CNSC website at least 60 days before the scheduled hearing to inform the public and Indigenous groups with hearing information, including information on how to intervene at the hearing. The CNSC also

sends a copy of the notice to identified Indigenous groups. This procedure enables interested parties to request intervenor status from the Commission for the public hearing and to send their comments on the EA report.

Public hearings are usually held at the CNSC headquarters in Ottawa, but the Commission may decide to hold such a hearing in a community in the vicinity of the proposed project.

The exact nature of the public hearing depends on whether the project is following an integrated or sequential EA and licensing process. This information is provided in the notice of public Commission proceeding.

Where other federal authorities provided expert information or knowledge during the conduct of the EA under CEAA 2012, the Commission may request their participation in the public hearing.

Following the public hearing, the Commission makes a decision, based on the EA, on whether the project is likely to cause significant adverse environmental effects, taking into account mitigation measures that were identified during the EA. This decision must be made before a licensing decision can be made on allowing the project to proceed.

If the Commission concludes that a project is not likely to cause significant adverse environmental effects in accordance with subsection 52(1) of CEAA 2012, the Commission (in accordance with section 53) must establish through the licensing process, the mitigation measures and follow-up activities that the applicant must implement.

If the Commission concludes that a project is likely to cause significant adverse environmental effects in accordance with subsection 52(2) of CEAA 2012, the Commission refers to the Governor in Council the matter of whether those effects are justified in the circumstances.

The Commission's decision is published on the CNSC website and the CEAR. Indigenous groups and members of the public who have expressed an interest in a particular project may be directly notified of the decision.

A.3 Specific CEAA 2012 environmental assessment requirements

Where the information is common to both the EIS and the licence application, the applicant may provide the information in either the application or the EIS, with appropriate cross-referencing between the submissions. The applicant shall clearly indicate where the requirements of both the NSCA and CEAA 2012 are addressed.

The EA of a designated project shall take into account the following factors as listed in subsection 19(1) of CEAA 2012:

a) the environmental effects of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to results from the designated project in combination with other physical activities that have been or will be carried out
b) the significance of those environmental effects
c) comments from the public that are received in accordance with CEAA 2012
d) mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project
e) the requirements of the follow-up program in respect of the designated project

f) the purpose of the designated project
g) alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alternative means
h) any changes to the designated project that may be caused by the environment
i) the results of any relevant study conducted by a committee established under section 73 or 74 of CEAA 2012
j) any other matter relevant to the EA that the responsible authority requires to be taken into account

Pursuant to subsection 19(2) of CEAA 2012, the scope of the factors to be taken into account under paragraphs 19(1)(a), (b), (d), (e), (g), (h) and (j) is determined by the Commission, as a responsible authority.

The EIS and supporting technical studies are completed to meet the requirements of CEAA 2012, paragraphs 19(1)(a), (b), (d), (e), (f), (g), (h) and, if appropriate, (i) and (j) in accordance with the scope of these factors as determined by the CNSC. The completion of the EIS and, as necessary, supporting technical studies is typically delegated to the applicant in accordance with section 23 of CEAA 2012. This regulatory document provides requirements and guidance to support project planning and early development of these documents by the applicant. These requirements and guidance do not negate the importance of pre-project engagement or the potential for project-specific EA guidelines.

A.3.1 Purpose of the project

Paragraph 19(1)(f) of CEAA 2012 states that the EIS shall identify the purpose of the project (defined as what is to be achieved by carrying out the project).

For further guidance, consult *Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* [14].

A.3.2 Alternative means for carrying out the project

Paragraph 19(1)(g) of CEAA 2012 states that the EIS shall identify and describe alternative means to carry out the project that are, from the perspective of the applicant, technically and economically feasible. As identified by the proponent, the alternative means include options for locations, development, and implementation methods, routes, designs, technologies, mitigation measures, and so on. Alternative means may also be related to the construction, operation, expansion, decommissioning and abandonment of a physical work.

The approach and level of effort applied to addressing alternative means is established on a project-by-project basis taking into consideration:

- the characteristics of the project
- the environmental effects associated with the potential alternative means
- the health or status of valued components (VCs) that may be impacted by the alternative means
- the potential for mitigation and the extent to which mitigation measures may address potential environmental effects
- the level of concern expressed by the public and Indigenous groups

The EIS should also describe the environmental effects of each alternative means. The criteria used to identify alternative means as unacceptable, and how these criteria were applied, should be

described, as should the criteria used to examine the environmental effects of each remaining alternative means to identify the preferred alternative.

For further guidance, consult *Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* [14].

A.3.3 Environmental effects

Paragraph 19(1)(a) of CEAA 2012 states that the EA must take into account the environmental effects of the designated project.

The environmental effects that must be considered in an EA under CEAA 2012 are also requirements under the NSCA. As described in section 4, the applicant should conduct an ERA in accordance with CSA 288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [6].

A.3.4 Malfunctions and accidents

Paragraph 19(1)(a) of CEAA 2012 states that malfunctions and accidents shall be assessed in the EA. Malfunctions and accidents should be separated into radiological and non-radiological (conventional).

The applicant should provide an assessment of potential health and environmental effects resulting from postulated radiological and conventional malfunctions or accidents. The EIS should also include any mitigation measures such as monitoring, contingency, clean-up or restoration work in the surrounding environment that would be required during or immediately following the postulated malfunction and accident scenarios.

The EIS should provide a description of postulated malfunction and accident sequences leading to a radiological or non-radiological release considering, as appropriate, internal events, external events and human-induced events, including their frequency and an explanation of how these events were identified, and any modeling that was performed.

The applicant can use a bounding approach or use facility- or activity-specific information (for example, design, operation, projected environmental releases) in the assessment of radiological accidents and malfunctions. If a bounding approach is used, the applicant should provide a detailed rationale for the selection of each bounding scenario.

The EIS should include the source, quantity, mechanism, pathway, rate, form and characteristics of contaminants and other materials (physical and chemical) likely to be released to the surrounding environment during the postulated malfunctions and accidents.

Note: Malfunctions and accidents are reviewed in depth under the NSCA for licensing purposes (for example, under REGDOC-2.4.1, *Deterministic Safety Analysis* [15], REGDOC-2.4.2, *Probabilistic Safety Assessments for Nuclear Power Plants* [16] and REGDOC-1.1.1, *Site Evaluation and Site Preparation for New Reactor Facilities* [17]). These scenarios should be taken into consideration by the applicant when designing environmental protection measures (see section 4).

If applicable, the applicant should use operating experience (OPEX) to identify any past abnormal operations, accidents and spills to the extent that they are relevant to the current assessment for the purposes of identifying malfunction and accident scenarios to be assessed.

A.3.5 Cumulative effects

Paragraph 19(1)(a) of CEAA 2012 states that the applicant shall assess any residual adverse environmental effects of the project in combination with other past, present or reasonably foreseeable projects and/or activities within the study area.

The applicant should explain the approach and methods used to identify and assess cumulative effects. The approach and methods should be consistent with *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* [18].

A.3.6 Significance of residual effects

Paragraph 19(1)(b) of CEAA 2012 states that the applicant shall assess the significance of any residual effects that persist, taking into consideration the proposed mitigation measures. These residual effects are identified during the ERA or a characterization of the environmental effects.

In the EIS, the applicant should include a detailed analysis of the significance of each residual effect. The applicant should clearly explain the method and definitions used to describe the level of the residual adverse effect (for example, low, medium, or high) for each of the issues. The applicant should also describe any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried on and how these levels were combined to reach an overall conclusion on the significance of the adverse effects for each valued component (VC).

Guidance

Some specific issues to be assessed are:

- magnitude of the effect
- spatial extent of the effect
- duration and frequency of the effect
- degree to which the effect can be reversed or mitigated
- ecological importance

The method used to describe the level of the adverse effect should be transparent and reproducible.

The EIS should identify additional criteria used to assign significance ratings to any predicted adverse effects. It should contain clear and sufficient information to enable the CNSC and the public to understand and review the applicant's judgement of the significance of effects. The applicant should define the terms used to describe the level of significance. In assessing significance against the criteria, the EIS should, where possible, employ relevant existing regulatory documents, environmental standards, guidelines or objectives such as prescribed maximum levels of emissions or discharges of specific hazardous substances into the environment or maximum acceptable levels of specific hazardous substances in the environment.

A.3.7 Socio-economic environment

The applicant should characterize the socio-economic environment and identify all indirect socio-economic effects.

An indirect effect is a secondary environmental effect that occurs as a result of a change that a project may cause to the environment. Paragraph 5(2)(b) of CEAA 2012 refers to any change to

the environment caused by the project on health and socio-economic conditions, physical and cultural heritage, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

For additional guidance, refer to *Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing that is of Historical, Archeological, Paleontological or Architectural Significance under the Canadian Environment Assessment Act, 2012* [19].

A.3.8 Community and Aboriginal traditional knowledge

Subsection 19(3) of CEAA 2012 states that community and Aboriginal traditional knowledge may be considered in the EA. CNSC staff will provide guidance to the applicant at the earliest possible stage in the EA process concerning the extent to which community and Aboriginal traditional knowledge shall be considered in the EA.

For additional information, refer to:

- *Considering Aboriginal traditional knowledge in environmental assessments conducted under the Canadian Environmental Assessment Act, 2012* [20]
- REGDOC-3.2.2, *Indigenous Engagement* [10] (for further information on the CNSC's expectations of applicants for Indigenous engagement)

A.3.9 Assessment of effects of the environment on the project

Paragraph 19(1)(h) of CEAA 2012 states that the EIS shall take into account how the environment could adversely affect the project. The applicant shall also take into account any potential effects of climate change on the project, including an assessment of whether the project might be sensitive to changes in climate conditions during its lifecycle.

Some adverse environmental conditions are flooding, severe weather, biophysical hazards (such as algae), geotechnical hazards and seismic events.

A.3.10 EA follow-up program

Paragraph 19(1)(e) of CEAA 2012 states that the EIS shall include a framework or preliminary program upon which EA follow-up actions will be managed throughout the life of the project.

The applicant should design the follow-up program to verify the accuracy of the EA predictions and to determine the effectiveness of the measures implemented to mitigate the potential adverse environmental effects of the project.

The applicant should also design the follow-up program to incorporate pre-project information that would provide the baseline data; compliance data such as established environmental quality criteria; regulatory documents, standards or guidelines; and real-time data consisting of observed data gathered in the field. As part of the follow-up program, the applicant should describe the compliance reporting methods to be used, including reporting frequency, methods and format.

Note: The CNSC, in collaboration with other federal authorities (where applicable), verifies and monitors all EA follow-up activities through the CNSC licensing and compliance process. EA follow-up monitoring activities may be integrated within the applicant's environmental protection measures.

Appendix B: Characterization of the Baseline Environment for an Environmental Assessment Under CEAA 2012

Note: Projects with environmental assessments (EA) already initiated under the *Canadian Environmental Assessment Act (2012)* (CEAA 2012) and led by the CNSC will continue under their current processes, as per the transition provision (section 182) of the IAA. The following appendix is relevant to those ongoing projects and will remain in this regulatory document for reference purposes until those projects are completed.

For a new licence, the applicant should use the information in this appendix to develop a characterization of the baseline environment. During the lifecycle of the facility or activity, the licensee should use this information to review and update the characterization, and also use the information in appendix C to document and predict the future environmental effects compared to this baseline characterization.

For additional information, see appendix D for a sample matrix for mapping the facility/activity-environmental-component interactions.

B.1 Atmospheric environment

The atmospheric environment includes the climate conditions at the site and in the local and regional study areas. It includes the seasonal variations in weather conditions within the study areas, to allow the assessment of effects on the facility or activity.

The applicant or licensee should provide a description of the existing ambient air quality in the study areas, with emphasis on characterizing radiological and non-radiological analytes.

The description should include meteorological information such as air temperature, relative humidity, precipitation, wind speed and direction, atmospheric pressure, and solar radiation. It should also include the occurrence of weather phenomena (for example, lightning, temperature inversions and fog). Special consideration should be given to the analysis of extreme and rare meteorological phenomena (for example, tornadoes).Uncertainties should be described and taken into account when discussing the reliability of the information presented.

The description should also include current ambient daytime and nighttime noise levels at the site and local study areas, and include information on its source(s), geographic extent and temporal variations. The description should provide ambient noise levels for other areas that could be affected by the facility or activity. Some examples are:

- increased traffic along transportation corridors to and from the site during construction
- receptors at residences and sensitive sites (such as hospitals, schools, daycare facilities, seniors' residences, and places of worship)

The applicant or licensee should describe the influence of regional topography or other features that could affect weather conditions in the study areas.

The baseline information should be sufficient to support the use of an atmospheric dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the project (for example, tornadoes).

B.2 Surface water environment

The surface water environment includes all surface water features and hydrology that affect surface water at the site or in the local and regional study areas. The applicant or licensee should include delineation of drainage basins at appropriate scales.

When documenting the water quality of all surface water, the applicant or licensee should demonstrate the use of appropriate sampling and analytical protocols, for the range of analytical parameters with the potential to be influenced by the facility or activity. This information should be presented using tables, maps and figures to provide an understanding of surface water characteristics and conditions at the site and in the local and regional study areas.

The applicant or licensee should describe hydrological regimes within the drainage basin, including seasonal fluctuations and year-to-year variability of all surface waters. The applicant or licensee should assess normal flow, flooding and drought properties of water bodies as well as the interactions between surface water and groundwater flow systems. The applicant or licensee should describe all water sources used for drinking water in the area, including source water intakes for drinking water treatment facilities.

The baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity (for example, flooding).

The applicant or licensee should document the sediment quality of all water bodies to be affected by the facility or activity, demonstrating the use of appropriate sampling and analytical protocols, for the range of analytical parameters with the potential to be influenced by the facility or activity. This information should provide an appropriate understanding of sediment characteristics and conditions on the site and in the local and regional study areas.

The study design should be fully described, including the allocation of samples in space and time, measurement methods and results.

The applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.

B.3 Aquatic environment

The aquatic environment includes the aquatic and wetland species at the site and within the local and regional study areas, including the flora, fauna and their habitats.

The applicant or licensee should seek information from relevant authorities (such as Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO) and provincial or territorial authorities) on aquatic and wetland species and habitat for the local and regional study areas. The applicant or licensee should also undertake independent studies to gather the necessary information.

The applicant or licensee should include a description of the food chain and food web dynamics as a habitat component as this relates to fish populations, and potential effects resulting from the facility or activity (such as impingement and entrainment).

The applicant or licensee should provide detailed habitat mapping that demonstrates habitat usage by fish within the study areas. This information should include depth profiles, substrate mapping, water temperature profiles, and a description of known and potential habitat usage (such as spawning, nursery, rearing, feeding and migratory) by fish that occur in the study areas.

The applicant or licensee should identify any biological species of natural conservation status (that is, rare, vulnerable, endangered, threatened or uncommon at a federal, provincial or municipal level) and their critical habitats, if identified.

The applicant or licensee should provide baseline characterization of radionuclide and hazardous substance levels in aquatic biota to support human and ecological risk assessment.

The applicant or licensee should fully describe the study design, including the allocation of samples in space and time, measurement methods and results.

The applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline date and methods, as well as the method(s) by which they have been addressed.

B.4 Geological and hydrogeological environment

The geological and hydrogeological environment includes the bedrock and overburden geology at both the local and regional scales.

B.4.1 Geology

The applicant or licensee should characterize the geomorphology, topography, quaternary geology and soil characteristics, structural geology, petrology, geochemistry, economic geology and hydrogeology. The applicant or licensee should also describe the geomechanical properties that apply to the region and at the site that will be disturbed.

The applicant or licensee should provide the geotechnical properties of the overburden, including shear strength and liquefaction potential, to allow for the assessment of slope stability and bearing capacity of foundations under both static and dynamic conditions.

The description of the structural geology should include regional, local and site-specific documentation of fractures and faults. It should include a description of primary geological features and deformation fabrics both at the site and within the local and regional study areas.

If applicable, the applicant or licensee should describe the coastal geomorphology and should include the characteristics of any lakefront or ocean bluffs, shoreline, and both near-shore zone and offshore zones.

The baseline characterization should be sufficient to assess effects of the environment on the facility or activity (for example, seismic effects).

The applicant or licensee should present a geological model that incorporates all overburden and bedrock information. If extrapolation is required to derive the stratigraphy, the applicant or licensee should explicitly discuss the uncertainties and the need for additional field investigations to reduce those uncertainties.

The applicant or licensee should describe the geotechnical and geophysical hazards including the consideration of subsidence, uplift, seismicity (and active faulting), and consider the potential for movement at the ground surface (including co-seismic rupture) and earthquake ground motions. A seismic hazard assessment should be provided. Where appropriate, the narrative descriptions should be supplemented by geological maps, figures, cross-sections, borehole logs and photographs (with specific location information).

B.4.2 Hydrogeology

The applicant or licensee should describe the hydrogeology at the site and in the local and regional study areas. The description should characterize the physical and geochemical properties of all overburden and bedrock hydrogeological units (from the ground surface to the uppermost basement unit, which is site dependent).

Units may be characterized as aquifers or aquitards, and unit descriptions should include their geochemical characteristics, vertical and lateral permeabilities, transport mechanism (diffusion versus advection) and directions of groundwater flow.

The applicant or licensee should identify the groundwater recharge and discharge areas, and describe in detail the groundwater interactions with surface waters.

The applicant or licensee should present a conceptual and numerical hydrogeological model that discusses the hydrostratigraphy and groundwater flow systems.

The applicant or licensee should provide a description of baseline groundwater quality at the site and in the local study area. The applicant or licensee should also describe local and regional potable groundwater supplies, including their current use and potential for future use.

B.5 Terrestrial environment

The terrestrial environment includes flora and fauna, their habitats, any wildlife corridors and the soil.

The applicant or licensee should describe the terrestrial species at the site and within the local and regional study areas, including flora, fauna and their habitat. The applicant or licensee should identify all biological species at risk (that is, endangered, threatened, special concern, extirpated at a federal, provincial or municipal level) known to occur in the area or where the site is within the range of the species.

The applicant or licensee should describe the presence and importance of wildlife habitat within the study areas, including critical habitats for listed species (if identified). The applicant or licensee should also describe any wildlife corridors and physical barriers to movement.

The applicant or licensee should identify all protected and conservation areas established by federal, provincial and municipal jurisdictions (for example, wilderness areas, parks, sites of historical or ecological significance, nature reserves, federal migratory bird sanctuaries and wildlife management areas).

The applicant or licensee should describe the existing soil quality (including hazardous and radiological substance concentrations) for all study areas, as well as any additional soil quality parameters potentially relevant for modelling purposes (such as transport and bioavailability of contaminants of potential concern).

The applicant or licensee should provide baseline characterization of radionuclide and hazardous substance levels in vegetation and other non-human biota to support human and ecological risk assessment. The characterization should also take into consideration the baseline conditions of other applicable environmental components (such as the atmospheric environment).

The applicant or licensee should undertake independent studies to gather the necessary information as appropriate. The applicant or licensee should describe field studies in terms of representativeness of the target populations where possible. The applicant or licensee should fully describe the design of the study, including the allocation of samples in space and time, measurement methods and results.

The applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed.

B.6 Ambient radioactivity

The ambient radioactivity arises from the sources, their activity levels and their origin, for all applicable environmental media (including air, soil, food, water, aquatic sediments and plant or animal tissue).

The applicant or licensee should describe the ambient radiological conditions at the site and in the local and regional study areas. The applicant or licensee should include information on the existing conditions, including an inventory of sources, their activity levels and their origin (natural or anthropogenic), for all applicable environmental media.

The applicant or licensee should fully describe the design of the study, including the allocation of samples in space and time, measurement methods and results.

The description should include an assessment of any limitations or gaps in the quality and extent of the baseline data and methods, as well as the method(s) by which they have been addressed.

B.7 Human health

The potential effects of the facility or activity on human health include both radiological sources and non-radiological contaminants.

The applicant or licensee should describe the current health profiles of the communities likely to be affected by the facility or activity, including information on population health of the communities in the local and regional study areas.

The applicant or licensee should provide, to the extent available, information on current consumption of locally grown harvests and country foods, and the quality by food type, amounts consumed, parts consumed (whole body or specific organs).

B.8 Indigenous land and resource use

Indigenous land and resource use includes lands, waters and resources of specific value; traditional activities and lifestyle; and traditional dietary habits.

Traditional land use may include areas where traditional activities such as establishing seasonal camps, camping, travel on traditional routes, gathering of country foods and medicines (hunting,

fishing, trapping, planting and harvesting) are being carried out. Traditional land use also includes spiritual sites of significance to Indigenous people.

The applicant or licensee should identify the lands, water and resources of specific social, economic, archaeological, cultural or spiritual value to Indigenous people, including established and asserted Indigenous or treaty rights that may be affected by the facility or activity.

The applicant or licensee should describe Indigenous land and resource use at the site and in the local and regional study areas. The applicant or licensee should identify traditional activities, including activities for food, social, ceremonial and other cultural purposes, in relation to such lands, waters and resources with a focus on the current use of lands, waters and resources for traditional purposes.

The applicant or licensee should describe the traditional dietary habits and dependence on country foods and harvesting for other purposes, including harvesting of plants for medicinal purposes. The analysis should focus on the identification of potential adverse effects of the facility or activity on the ability of future generations of Indigenous people to pursue traditional activities or lifestyle.

Appendix C: Environmental Effects for an Environmental Assessment Under CEAA 2012

Note: Projects with environmental assessments (EA) already initiated under the *Canadian Environmental Assessment Act (2012)* (CEAA 2012) and led by the CNSC will continue under their current processes, as per the transition provision (section 182) of the IAA. The following appendix is relevant to those ongoing projects and will remain in this regulatory document for reference purposes until those projects are completed.

The licensee should have already developed a characterization of the baseline environment (see appendix B) and should use the information in this appendix to document the environmental effects of a facility or activity. For additional information, see appendix D for a sample matrix for mapping the facility/activity-environmental-component interactions.

C.1 Atmospheric environment

The licensee should characterize the effects of the facility or activity on the atmospheric environment during all phases of the lifecycle for the facility or activity, including postulated accident and malfunction scenarios.

The licensee should identify and characterize all atmospheric emissions (radiological and non-radiological) expected to be generated during all phases of the lifecycle for the facility or activity, including postulated accident and malfunction scenarios. This information should include average and maximum emissions from planned discharges, point sources and fugitive (non-point source) releases (including greenhouse gases).

The licensee should complete modelling that incorporates baseline (or existing ambient) air quality in combination with the predicted site-specific atmospheric characteristics (such as shoreline fumigation) to assess potential effects on air quality, the transport of atmospheric contaminants and any associated exposure to humans and non-human biota receptors.

The licensee should describe predicted effects of noise on terrestrial and aquatic species as well as on nearby residents and communities. The description should include both daytime and nighttime noise levels and tonal noise. The predicted sound levels should be compared against baseline levels and any guidelines published by recognized organizations.

C.2 Surface water environment

The licensee should describe the effects of the facility or activity on the surface water environment during all phases of the lifecycle for the facility or activity, including accident and malfunction scenarios.

The licensee should identify and characterize all liquid effluents that could be generated during all phases of the facility or activity. Some examples are:

- average and maximum emissions from point sources (concentrations/activity levels and volumes)
- planned discharges
- fugitive releases
- deposition from airborne particulates
- surface runoff

C.3 Aquatic environment

For all phases of the lifecycle for the facility or activity, the licensee should describe the effects of the facility or activity on aquatic flora and fauna, and include a full accounting of effects on species of natural conservation status and their habitat. This evaluation should be based on results of field monitoring studies or predictions from an ecological risk assessment.

The description should be clear on how predicted effects to the biota exposed to the stressor compare to the expected reference condition for unexposed biota on a biological population basis, taking natural variation into account. Predictions of effects should include sufficient detail to allow follow-up verification.

Some potential effects are:

- effects on habitat, including aquatic vegetation and sensitive areas such as spawning grounds, nursery areas, winter refuges and migration corridors
- effects on aquatic species, including rare or sensitive species
- effects of blasting on fish and fish habitat on local aquatic systems
- contaminant exposures through environmental and food-chain transport
- effects on aquatic biota due to impingement and entrainment
- effects of infilling on loss of fish habitat and changes to productive capacity
- effects of thermal plume(s) on fish and fish habitat
- effects on wetlands

Under the NSCA, the CNSC assesses the ongoing operation of nuclear facilities and activities to ensure protection of the environment and the health and safety of persons.

Under the Memorandum of Understanding between CNSC and Fisheries and Oceans Canada (DFO), the CNSC is responsible for conducting reviews of licence applications to assess the potential effects on fish and fish habitat, and to ensure that the assessment process considers the intent and requirements of the *Fisheries Act*, the *Species at Risk Act* and their associated regulatory and policy frameworks.

C.4 Geological and hydrogeological environment

The geological and hydrogeological environment includes the bedrock and overburden geology at both the local and regional scales.

C.4.1 Geology

The licensee should fully describe any changes to the geology and geomorphology resulting from the facility or activity, including any interrelationships with the groundwater regime.

The licensee should describe any changes to the environment resulting from the removal of bedrock and/or unconsolidated deposits. The licensee should also describe the disturbance of soils or sediments that may be stockpile, used for construction purposes or otherwise perturbed.

The licensee should include an assessment of changes made that would affect coastal processes and features (such as changes to the shoreline morphology due to construction, erosion or sediment transport).

C.4.2 Hydrogeology

The licensee should describe and assess any effects the facility or activity may have on the groundwater regime including the quantity and quality of groundwater and how these effects may influence surface waters. The licensee should carry out modelling as needed to develop and test the predicted effects.

C.5 Terrestrial environment

The licensee should describe the effects of the facility or activity on terrestrial fauna and flora and include a full accounting of effects on species with elevated conservation status and their habitat. This evaluation should be based on results of field monitoring studies or predictions from an ecological risk assessment. The description should be clear on how predicted effects to the biota exposed to the stressor compare to the expected "reference condition" for unexposed biota on a biological population basis taking into account natural variation. Predictions of the effects should include sufficient detail to allow follow-up verification.

Some potential effects that should be considered are:

- loss of terrestrial habitat and the quality of lost habitat for relevant species
- disturbance of feeding, nesting or breeding habitats
- physical barriers to wildlife
- disruption, blockage, impediment and sensory disturbance (such as light effects, noise and vibration) of daily or seasonal wildlife movements (such as migration or home ranges)
- direct and indirect wildlife mortality
- reduction in wildlife productivity
- contaminant exposures through environmental and food-chain transport
- effects on biodiversity

C.6 Ambient radioactivity

The licensee should describe the effects of the facility or activity on ambient radioactivity. Humans and non-human biota exposed to ambient radioactivity should be assessed for all relevant routes of exposure (both internal and external exposure scenarios).

To support the assessment of human health (see section 3.2.7), the licensee should provide information on radiation levels to which members of the public may be exposed, including consideration of consumers of country food whose exposure pathways may differ due to cultural norms; for example, any dietary characteristics of Indigenous peoples.

C.7 Human health

The licensee should describe the potential effects of the facility or activity on the physical well-being of Indigenous groups and other people resulting from biophysical effects, including the effects of the facility or activity on all environmental components (for example, atmospheric environment) and the resulting effects on human health.

Some examples are:

- an analysis of the effects of the facility or activity on the health and safety of the public, including the possible effects from malfunctions and accidents (radiological and conventional)

- the predicted radiation doses to members of the public resulting from activities within the scope of the facility or activity and any resulting health effects
- a description of quantitative risk assessment modeling conducted, where necessary, for any malfunctions and accidents
- an assessment of the potential effects on human health from all non-radiological contaminants released from the facility or activity, through all potential exposure pathways
- potential effects of noise generated from the facility or activity on human receptors within the study area(s)

C.8 Indigenous land and resource use

The licensee should identify any change that the facility or activity is likely to cause in the environment and any effect of any such change on the health and socio-economic conditions, physical and cultural heritage and on the current use of lands and resources for traditional purposes by any Indigenous group including effects on hunting, trapping, fishing and gathering.

The licensee should identify any concerns raised by Indigenous people about the facility or activity in relation to any Indigenous or treaty rights.

For further information on the CNSC's expectations of licensees for Indigenous engagement, see REGDOC-3.2.2, *Indigenous Engagement*. [10]

Appendix D: Sample Matrix of Biophysical Interactions

Pathways to residual effects from the facility or activity on the environment

Phase (if applicable)	Activity	Atmospheric environment		Surface water environment				Aquatic environment				Geological and hydrogeological environment		→
		Air quality	Noise levels	Surface hydrology /drainage	Lake level	Shoreline / basin integrity	Water quality	Sediment quality	Aquatic habitat	Benthic invertebrate and fish population / distribution	Aquatic health	Groundwater quality and quantity	Flow or water table elevation	*(continued on next page…)*
Site preparation (e.g., site clearing, excavation)														→
														→
Construction (e.g., pouring foundations, facility construction)														→
														→
Operation (e.g., emissions and effluents)														→
														→
Decommissioning (e.g., cleanup and decontamination)														→
														→

○ = Facility/activity-environment interactions that have been determined to result in no residual effects

● = Facility/activity-environment interactions that have been determined to result in potential residual environmental effects *(continued on next page)*

Pathways to residual effects from the facility or activity on the environment (continued)

Phase (if applicable)	Activity	Terrestrial environment					Ambient radio-activity		Human health					Indigenous land and resource use	
		Soil quality and quantity	Vegetation communities / species / listed plants	Wildlife habitat	Wildlife population / distribution	Wildlife health	Radiation exposure and levels	Food stuffs	Radiation doses to the general public	Radiation doses to workers	Non-radioactive contaminant exposure to the general public	Non-radioactive contaminant exposure to workers	Conventional health and safety	Social or economic, archaeological, cultural or spiritual value for traditional purposes	Asserted Indigenous Rights or Title
Site preparation (e.g., site clearing, excavation)															
Construction (e.g., pouring foundations, facility construction)															
Operation (e.g., emissions and effluents)															
Decommissioning (e.g., cleanup and decontamination)															

○ = Facility/activity-environment interactions that have been determined to result in no residual effects

● = Facility/activity-environment interactions that have been determined to result in potential residual environmental effects

Glossary

For definitions of terms used in this document, see REGDOC-3.6, *Glossary of CNSC Terminology*, which includes terms and definitions used in the *Nuclear Safety and Control Act* and the regulations made under it, and in CNSC regulatory documents and other publications. REGDOC-3.6 is provided for reference and information.

References

The CNSC may include references to information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC Web page "How to gain free access to all nuclear-related CSA standards".

1. CSA Group, CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use*, 2004 (1st edition).
2. CSA Group, CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* (successor editions).
3. CSA Group, CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*.
4. CSA Group, CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*.
5. CSA Group, CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*.
6. CSA Group, CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*.
7. CSA Group, CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*.
8. Canadian Nuclear Safety Commission (CNSC), regulatory guide G-129 revision 1, *Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)"*, Ottawa, Canada, 2004.
9. CNSC, REGDOC-3.2.1, *Public Information and Disclosure*, Ottawa, Canada, 2018.
10. CNSC, REGDOC-3.2.2, *Indigenous Engagement*, Ottawa, Canada, 2019.
11. CAN/CSA ISO 14004:2004, *Environmental Management Systems – General Guidelines on Principles, Systems and Support Techniques*.
12. CNSC, REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response*, Ottawa, Canada, 2016.
13. CNSC, *Generic Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012*, Ottawa, Canada, 2016.
14. CEAA, Operational Policy Statement *Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012*, Ottawa, Canada, 2015.
15. CNSC, REGDOC-2.4.1, *Deterministic Safety Analysis*, Ottawa, Canada, 2014.
16. CNSC, REGDOC-2.4.2, *Probabilistic Safety Assessment for Nuclear Power Plants*, Ottawa, Canada, 2014.
17. CNSC, REGDOC-1.1.1, *Site Evaluation and Site Preparation for New Reactor Facilities*, Ottawa, Canada, 2008.
18. CEAA, Operational Policy Statement *Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*, Ottawa, Canada, 2015.

19. CEAA, Technical Guidance Document *Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing that is of Historical, Archeological, Paleontological or Architectural Significance under the Canadian Environment Assessment Act, 2012*, Ottawa, Canada, 2015.

20. CEAA, *Considering Aboriginal traditional knowledge in environmental assessments conducted under the Canadian Environmental Assessment Act, 2012*, Ottawa, Canada, 2015.

Additional Information

The following documents provide additional information that may be relevant and useful for understanding the requirements and guidance provided in this regulatory document:

- Government of Canada, *A Framework for the Application of Precaution in Science-based Decision Making about Risk*, Ottawa, Canada, 2003

CNSC Regulatory Document Series

Facilities and activities within the nuclear sector in Canada are regulated by the CNSC. In addition to the *Nuclear Safety and Control Act* and associated regulations, these facilities and activities may also be required to comply with other regulatory instruments such as regulatory documents or standards.

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2.0 Safety and control areas

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2.9 Environmental protection
2.10 Emergency management and fire protection
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2.12 Security
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